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COLD-BENDING OF PIPE AND METAL SHAPES

Principles Involved in the Bending of Pipe, Tubes, and Other Metal Shapes; Types of Bending Machines; and the Application of Ram and Rotary Automatic and Manually Operated Machines

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THE design of bending machines for pipes, tubes, and bars has long occupied the inventive faculty of engineers. The first patent issued by the United States Patent Office on a bending machine of any type is dated December 12, 1854, and was for a machine designed for the bending of flat steel bars. It is of interest to note this accompanying comment in the Patent Index: "This improved machine is too complex to be understood without the specifications and all the drawings, which are too complex to be given here." The first patent on a machine that may be said to be the forerunner of present-day equipment was issued July 21, 1868. Obviously, this was a manually operated device.

In spite of the long history of bending machines, there are still applications where hand bending is more advantageous than the use of a machine.

Bends of very short radii or bends made in materials of low ductility at ordinary temperatures can often be made by heating the part to be bent and then bending it to the required shape by manual power; at best, chain blocks or winches are sufficient to provide the necessary equipment. Such bending is usually done on a flat table with a great many holes in it into which pins are set as required to guide and restrain the work being bent. Bends in small pipes, tubes, or bars, when great accuracy is not required, are usually accomplished most easily by hand. An example of such bending is small copper pipe used in lubricating systems.

Types of Pipe-Bending Machines

In almost all cases, however, machine bending is quicker and easier, and produces better results than hand bending. Present-day bending machines may be divided into three general groups:

1. Ram type, power-driven machines. In these machines, the form over which the bend is made moves in a straight line, and the bend is accomplished by pushing the form against the material at the location of the bend. Usually, such bends are made in a number of separate pushes. These machines are usually hydraulically operated.

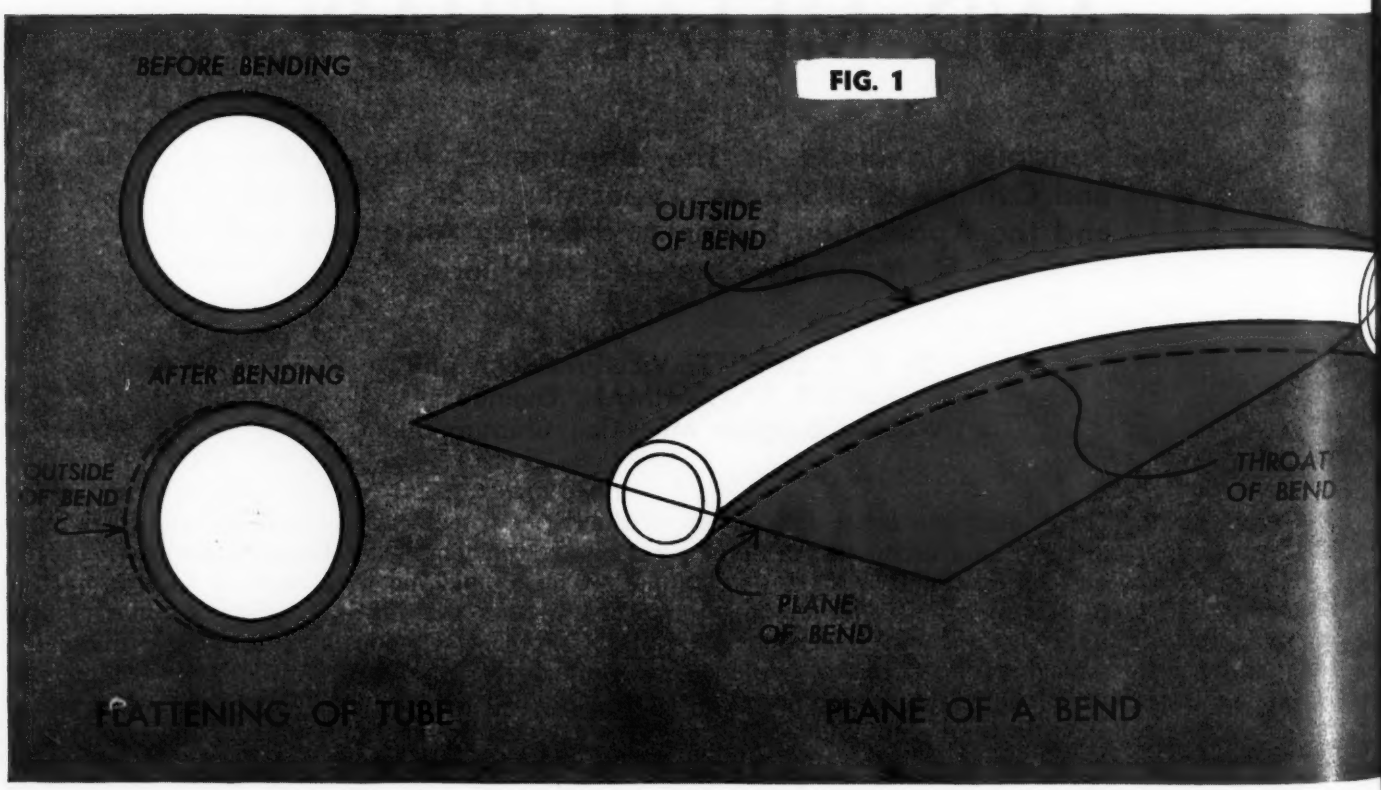
2. Rotary type, power-driven machines. This is a type of machine in which the section to be bent is wrapped around a rotating form which has the contour of the desired bend. This group of machines may, in turn, be subdivided into two classes according to the type of drive used for the rotation of the form. One of these is the hydraulic type, which has found increasing favor in recent years. The other is the mechanical gear-driven machine.

3. Rotary type, manually operated machines. This class is identical in principle to the rotary type, power-driven machine, except that it is operated by hand power.

Principles Involved in Making a Bend

The simplest way in which a small pipe might be bent would be, perhaps, to grasp each end of the pipe with the hands and bend it over the knee. In principle, this is the way in which the ram type machine operates. When the bent pipe is examined, it is likely to be found that it has flattened in the bent part, so that at this point it has become oval, as shown in Fig. 1. The short "diameter" of the oval lies in the plane of the bend. This term "plane of the bend" will require definition. Visualize a bent piece lying flat on a table, the surface of which is level. Then, the plane of the bend is the plane in space above the table top, parallel to the table top and passing through the center of the bent material, as indicated in the illustration.

Fig. 1. Diagrammatic Illustration Indicating Deformation of a Tube during Bending, and Defining the Meaning of the Term "Plane of a Bend"



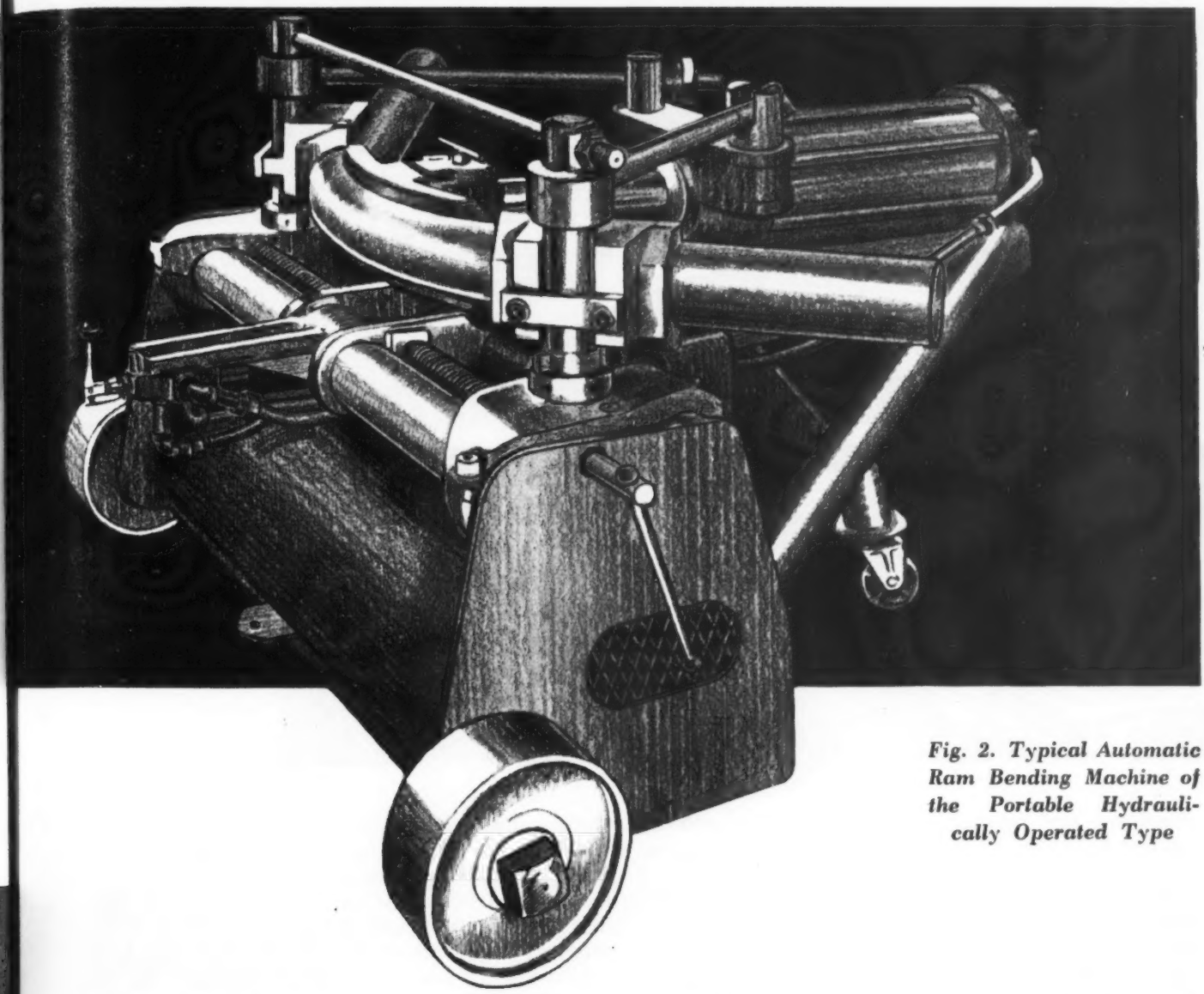


Fig. 2. Typical Automatic Ram Bending Machine of the Portable Hydraulically Operated Type

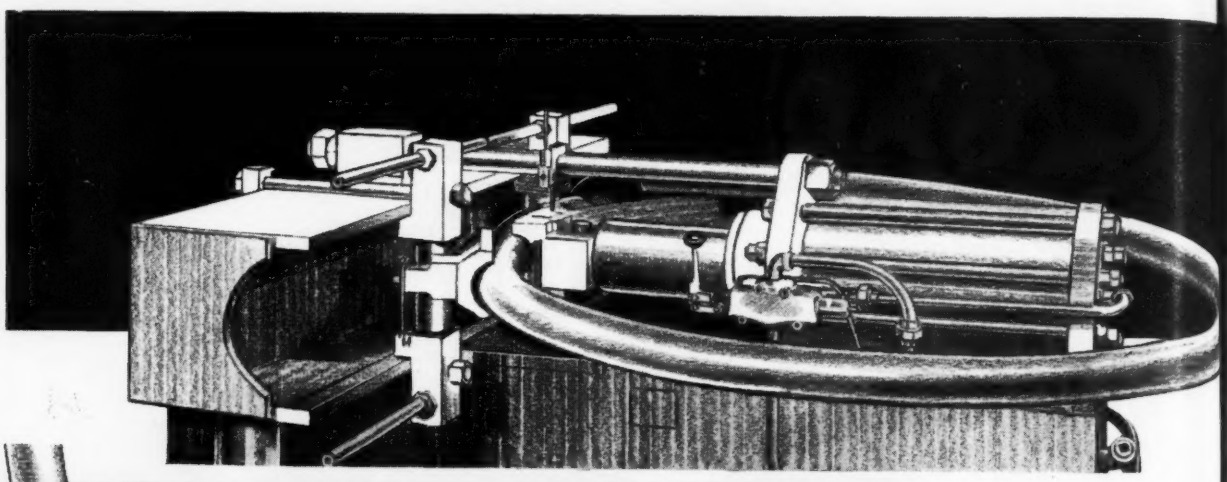
Possibly this flattened shape of the bent tube may not be acceptable for the use to which it is to be put. In such a case, the tube may be filled with something that will keep it round while it is being bent and that can be removed after the bend is made. The filler material may be sand, tightly packed into the tube; a spring of about the same size as the inside of the tube; or any similar material that will support the inside walls and at the same time be flexible enough to permit the tube to be bent. This, in principle, is all that there is to pipe or tube bending.

In a bending machine, there are three essential tools for making the bend, which roughly correspond to the knee and two hands used in making the simplest type of bend. In addition, power must be provided to overcome the resistance of the pipe to bending; there will be a frame to keep the bending tools in proper relationship to each other; and, if needed, a filler is used to reduce the flattening of the pipe as it bends.

Briefly, the tools used in a bending machine are as follows: (1) *The form.* This is the part around which the tube is bent. (2) *The pressure dies.* These are the tools which guide the material around the form and correspond to the hands in a simple hand bending operation. In the rotary bender, one of the pressure dies is called the "clamping die," and functions differently from the other die, known as the "pressure die." The purpose of the two dies, however, is the same—to guide the material around the form. (3) *The mandrel.* This is the filler material which maintains the shape of the piece being bent. (4) *The shoe.* This tool is used in special cases only; its purpose will be described later in this series of articles.

Bending on Automatic Ram Machines

If in the elementary illustration of bending over the knee just referred to, the hands had been held



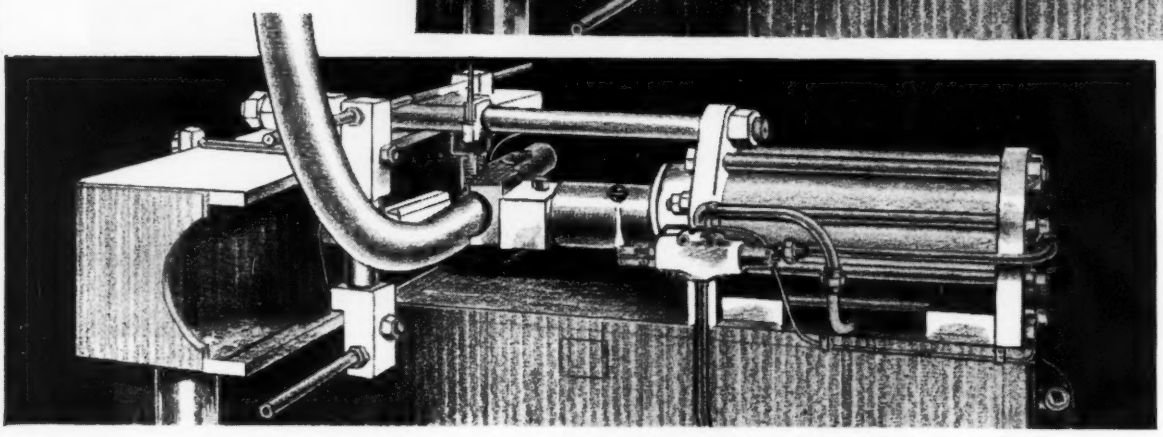


Fig. 3. (Left) An Example of the Making of a Compound Bend. Fig. 4. (Above) Bending a Complete Circle or Ring on a Ram Type Machine

steady in one position and the knee brought up against the tube, we would have had the equivalent of a ram type bending machine. Fig. 2 shows a portable, hydraulically operated machine of this type. It will be noted that in this machine there are two pressure dies for holding and guiding the pipe. Although mounted in a fixed position on the frame of the machine, these dies are free to rotate about their own mounting pins so as to adjust themselves to the pipe during the bending operation. The form is mounted centrally between the dies, and is direct-connected to the piston-rod of the hydraulic cylinder, so that when it moves forward, it pushes the pipe between the two pressure dies. Obviously, when it returns, it releases the pipe from the dies.

This type of machine is extremely useful where it is applicable, but its use is limited in that it is not suitable for high-production work. While it is not easy to accomplish a smooth, blemish-free job on a ram machine, it can produce excellent work in the hands of an experienced man. Machines of this type are especially valuable in industrial maintenance and repair work and in building construction. The reason for this is their great flexibility in operation.

For instance, a set of tools on a ram type machine is made to hold material of a given size, and the form is usually machined for a specified bend radius; but with a little experience, an operator can make a bend of any radius larger than that provided for by the form. Furthermore, these machines provide for easy tool changes to accommodate different kinds of materials. While different kinds of materials of one size or shape can be bent with tools intended for another material, this is not recommended practice.

Applications of the Ram Type Machine

The ram machine has three major fields of application: (1) For straightening material that has been accidentally bent or deformed. (2) For putting the finishing touches on bends that have been made by another method, but that are not sufficiently accurate; this finishing operation, being done cold, has particular value in the final fitting of pipe that has been previously bent and then galvanized after the first bending operation, as the ram bender will not destroy the galvanized finish when correcting the pipe bend. (3) For making complete bends.

In making a bend, the first step, after the length of material necessary for the required bend has been laid out, is to locate the two pressure dies. As indicated in Fig. 2, the die-holders are mounted on adjusting screws, by means of which they can be moved toward or away from the form. The next

step is to divide the length of the bend to be made by the length of the form, in order to determine how many operations the bend will require. For example, if the bend length is 80 inches and the length of the form is 25 inches, it is well to plan on four separate operations or pushes for completing the bend.

A sequence of bends can be made either by starting in the middle and working outward in both directions or by starting at one end and working toward the other. Experience will soon indicate which method is to be preferred. Having decided on which order of bending to follow, the operator places the material in the dies opposite the form. The machine is provided with adjustable supports in the frame, or bed, to hold the material at the right height for bending.

Now the actual bending begins. If the bend radius is equal to the form radius, the ram should be advanced until the bent section fits the form completely. The ram should never be permitted to advance beyond this point, because a further movement will cause severe deformation or even actual shearing of the material being bent. If the radius of the bend is longer than the form radius, the ram should not be advanced as far as when the bend radius and form radius are alike. Experience again will teach the operator the correct ram movement in different cases. After having been advanced the necessary amount, the ram is returned to free the material. The semi-finished bend is now moved to the next position and the cycle is repeated as often as necessary to complete the bend.

Fig. 3 shows an example of compound bending. It illustrates a case where the straight portion between the two bends is long enough so that the job actually consists of two simple bending operations, but in different planes. When the two bends are very close to each other, a readily improvised adaptation of one of the pressure dies will permit these compound bends to be made.

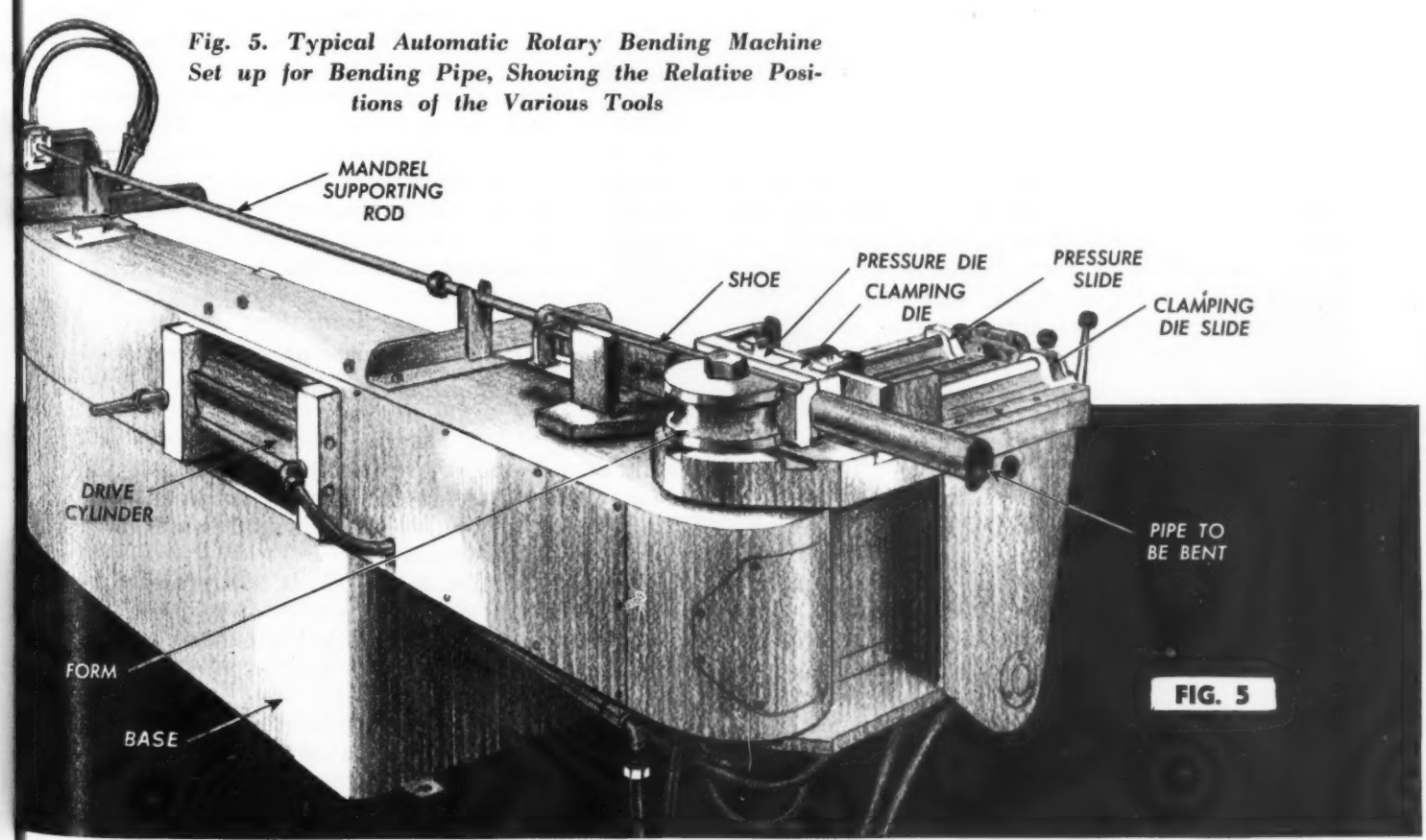
Fig. 4 shows a complete circle or ring. If only one or a few of these circles are to be bent and if smoothness of the bend is not highly important, a special form is not required when a ram type machine is used. Production bending of rings, however, is usually performed on rotary benders.

Bending on a Rotary Automatic Machine

As mentioned, the ram type machine is too slow for mass production work. Hence, improved machines had to be designed for work where a large number of identical bends were to be produced. This gave rise to the rotary power-driven type of bending machine, an example of which is shown in Fig. 5.

The striking difference between the rotary type

Fig. 5. Typical Automatic Rotary Bending Machine Set up for Bending Pipe, Showing the Relative Positions of the Various Tools



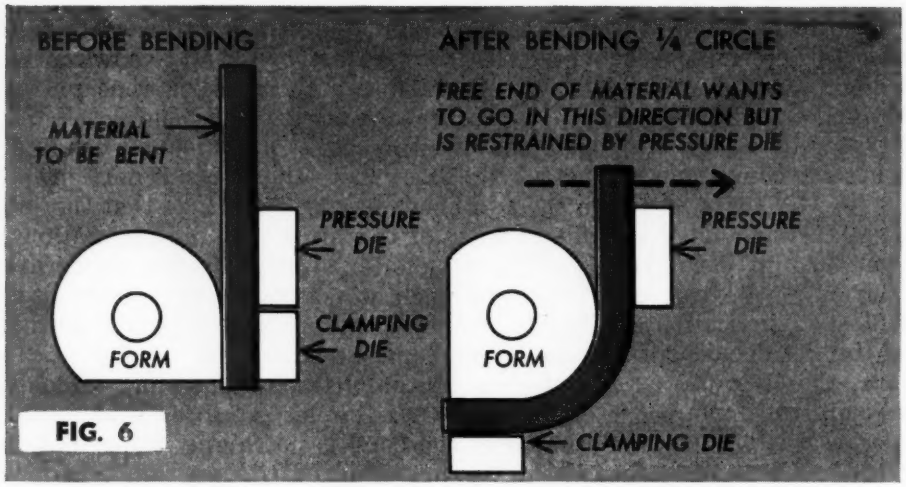


Fig. 6. Diagrammatic View Showing how Bending is Performed on a Rotary Machine

and the ram type of bending machines is the design and method of operation of the form. The pioneer designer asked himself this question when confronted with a mass production problem: "Since a lot of identical bends are to be made, why not make a form that will produce exactly that bend? True, it will be good for only that bend, but if it operates fast enough, it will still be economical." Thus, the rotary type machine came into being.

If one end of a straight piece of material is securely clamped to the required form and this form is made to rotate, it is obvious that, if the free end of the pipe is restrained so that it can move only along its original straight line (see Fig. 6), the material to be bent will be pulled around by the form as the latter rotates and will be bent to the same shape as the form. This is the principle involved in rotary bending.

The elements are identical to those employed in ram bending machines. There is a form and two pressure dies. One of these rigidly clamps one end of the material to the form. Because of this function, it is generally called the "clamping die." The other pressure die restrains the free end of the material, so that the bend around the form is made possible.

Application of the Mandrel in Rotary Bending

The mandrel previously mentioned is quite easily introduced into this kind of bending. As the bend is being made, the only section of the material being formed at a given instant is the section that is just beginning to follow the curved form. It is this section that has the greatest tendency to flatten, since the whole bending force is exerted on it. The material ahead of it has already been bent and the material behind it is not yet bent. Hence, there is no severe strain on those parts of the tube.

During the entire course of bending, each little section of the material passes through this critical period—each, of course, at different times, but all at exactly the same place relative to the machine frame. Hence, if a mandrel is inserted just at that place it will support, gradually, the whole length of the bend. Since all the unbent portion of the material lies in a straight line, the mandrel can be mounted on a straight rod which is attached to the machine frame behind the back end of the material. Thus it becomes part of the machine, and no time need be spent in filling the bent part with material, such as sand, and in emptying it. In Fig. 5, the mandrel may be seen supporting the pipe and extending out of the back end of it. Obviously, mandrels are necessary only when hollow sections are being bent and the flattening must be kept to a minimum.

Fig. 5 shows a rotary bending machine completely set up to bend a piece of pipe. The tools and their relative positions are indicated in the illustration. The form is seen in the foreground and the clamping die, pressure die, and shoe are grouped around it in position to fulfill their various duties. The mandrel is inside the pipe at the point where the bend begins.

Main Design Features of a Rotary Bending Machine

Briefly, a rotary bending machine consists primarily of a frame whose function it is to hold the various tools rigidly in their correct relative positions. The following are the principal points to be considered in the design:

1. The form must rotate. It is, therefore, connected to the frame in such a way as to permit it to rotate or turn. It is rigidly fastened to a vertical shaft supported in two bearings in the machine frame.

2. The clamping die must hold one end of the material securely against the form during the entire bending operation. It must, therefore, follow the form as the latter rotates. Hence, the clamping die is mounted on a strong arm, rigidly connected

to the same vertical shaft as the form. In this way, form and clamping die turn together. The supporting arm for the die is heavily constructed, so that enough pressure can be applied on the material to prevent it from slipping.

3. The pressure die restrains the free end of the tube from moving out of its original straight-line position. Therefore, this die is located in a fixed position on the frame.

4. The mandrel is inserted at the point in the pipe where the bending begins. This is at a fixed point on the machine, so that the mandrel is also connected to the frame through a comparatively long supporting rod that holds it at a fixed position relative to the frame. The expressions "fixed location" and "rigidly attached" are intended to convey the idea that the tools are thus definitely placed for one kind of bend, in a certain size of material, bent to a certain shape. Adjustments must be provided in the machine so that the tool locations and the tools themselves can be adapted for making other bends within the capacity of the machine.

The machine shown in Fig. 5 is a modern type, adapted for quick operation and adjustment. The clamping and pressure dies are mounted on slides, so that they can be moved back quickly when the material to be bent is placed in, or removed from, the machine. These slides are moved by hydraulically operated toggle joints which provide positive locking action of the dies in their bending position and the necessary pressure on the clamping die to securely hold the material to be bent. The position of the die-holders on the slides can be changed to suit various sizes of material and different bends. This is accomplished by screw adjustments. The mandrel support must also be adjustable for different types of bends, and is mounted on a slide for this reason.

Rotation of the form is effected by the movement of the drive cylinder piston, the cylinder being located in the bed, at the left in the illustration. The vertical shaft on which the form is mounted is rotated by the piston through a connecting link and crank or a chain. The base of the machine also houses other elements of the

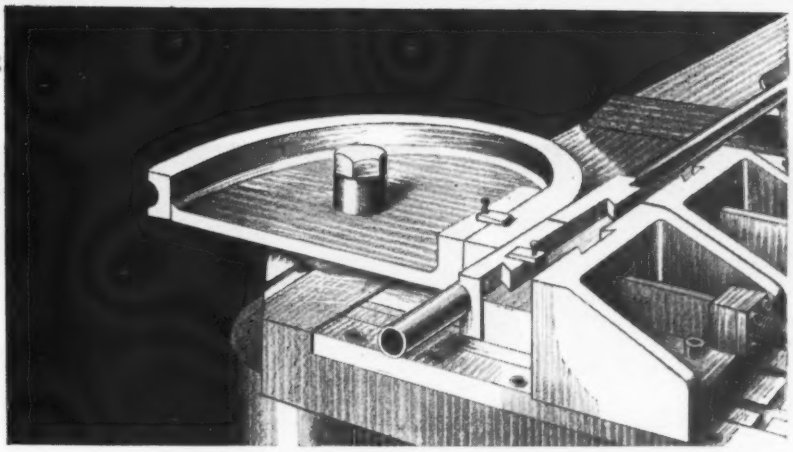


Fig. 7. First Step in Bending a Tube to a Complete Circle

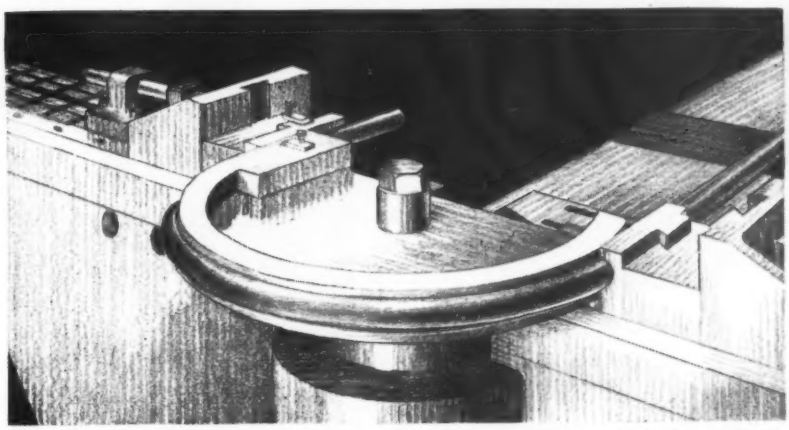


Fig. 8. Tube after having been Bent to a Half Circle

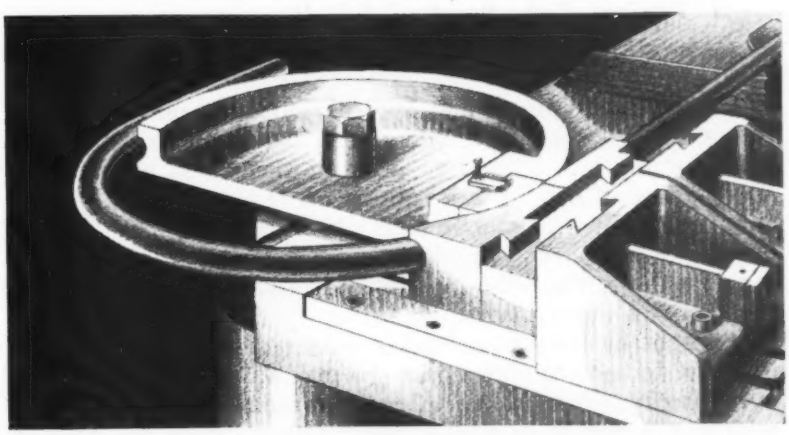


Fig. 9. Machine Ready to Bend the Tube to a Full Circle

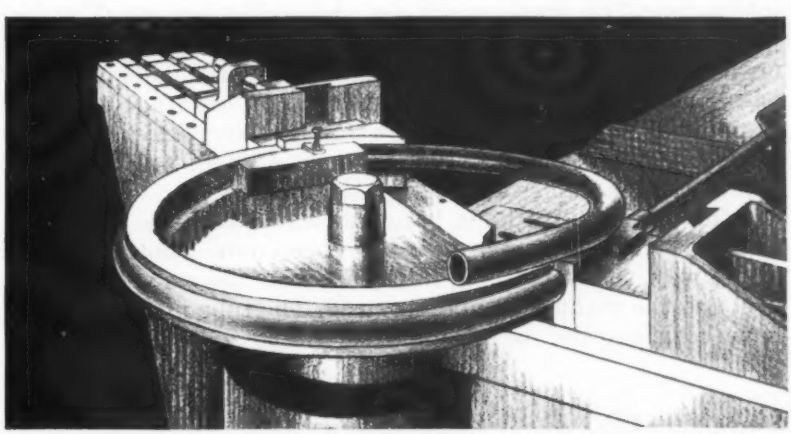


Fig. 10. The Full Circle Bend Completed

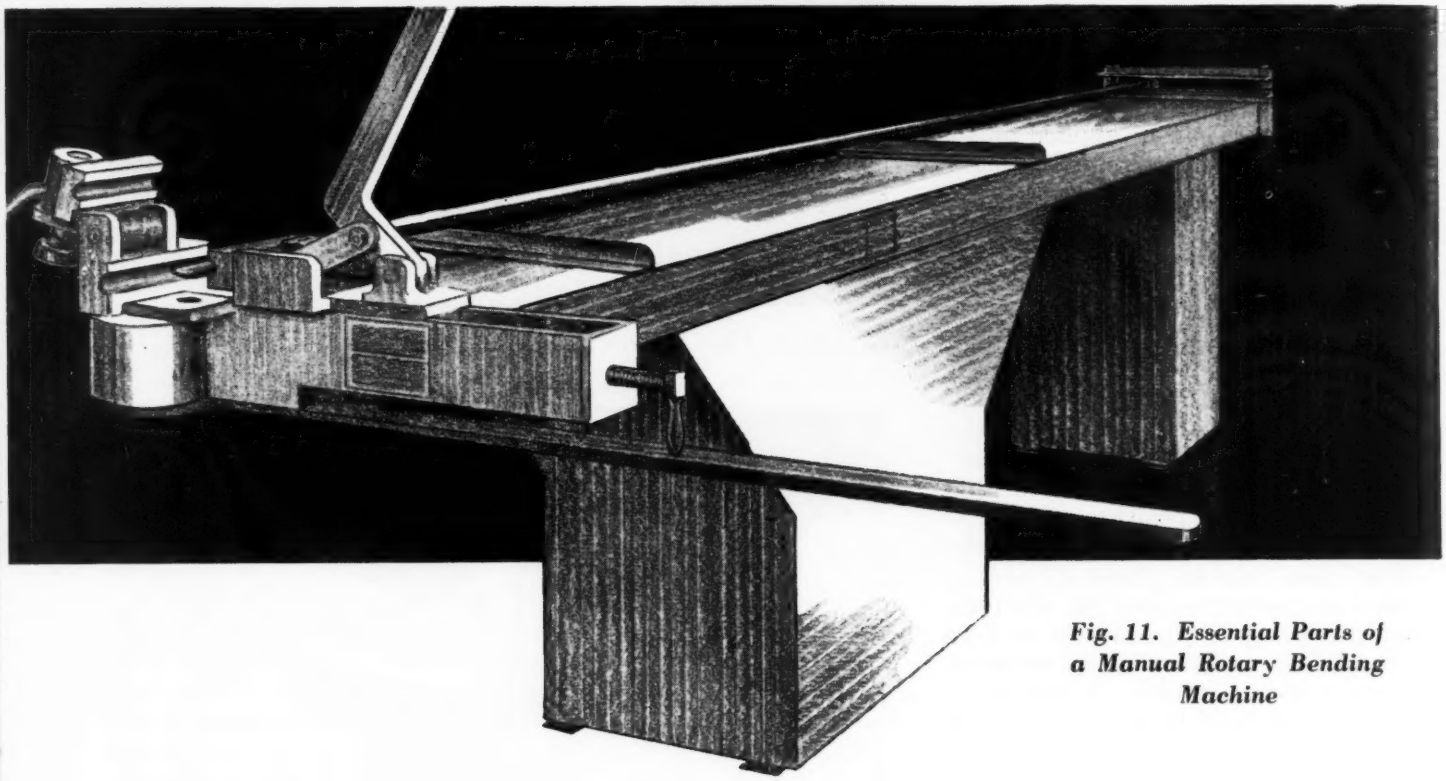


Fig. 11. Essential Parts of a Manual Rotary Bending Machine

power system, including the hydraulic pump, the pump motor, valves, and an oil storage tank.

A Typical Tube-Bending Job Done on a Rotary Machine

A brief description of a typical job done on a rotary type of machine will give a better understanding of its functioning. Assume the job to be the bending of a tube to a full circle. This can be done on a ram type machine, as already explained, but it is a comparatively slow operation. On a rotary machine, the tube can be bent to a circular form in two quick operations.

It might be mentioned at the outset that as the material to be bent slides past the pressure die and over the mandrel, there is considerable friction, which will result in undue wear unless there is proper lubrication. Before preparing to bend, therefore, the following machine parts should be lubricated: The pressure die and shoe; all parts of the material that pass the tools; and the mandrel, or, if possible, the inside of the material which will pass over the mandrel. Any of the special bending compounds on the market or a fairly heavy machine oil, equivalent to S A E 30 or S A E 40, are satisfactory as lubricants.

After these parts have been lubricated and the clamping die and pressure die have been moved out of the way, the tube is slid into place over the mandrel and the mandrel supporting rod. The tube may have been marked as to length or, if the job consists of a production run of identical bends, a fixed stop may be mounted on the mandrel supporting rod to determine the proper location of the tube, as the mandrel must be in a predetermined position with respect to the other tools. This position must be adjustable, since it may vary considerably for various types of bends on different materials.

The pressure die, actuated by its slide, is now moved forward until it is close against the tube. The term "pressure die" is of longstanding use in the trade, but is a rather unfortunate one, since the important function of this tool is to restrain the reaction of the end of the tube behind the bend and not to apply pressure. Finally, the clamping die is moved forward and considerable pressure applied; it is highly important that the pressure be sufficient, because the material *must not slip when bending*.

The tools are now in the position shown in Fig. 7 and the machine is ready to perform the bending. The form is next rotated to bend half of the circle. Fig. 8 shows the bent semicircle on the machine.

Now the mandrel, the pressure die, and the clamping die are moved out of the way, so that the form can be rotated back to its initial position. The tools are then once more advanced into their bending positions and the machine is in readiness for bending the second semicircle, as shown in Fig. 9. Fig. 10 shows the completed circle before the pipe is removed from the machine. In making a bend of this type, it is advisable to have a block with an inclined top mounted on the machine, so that on

the second bend, the bent part of the circle may be guided up and over the unbent part and the pressure die. By the addition of simple fixtures of this type, the making of many different kinds of bends is greatly facilitated.

There are, of course, many variations in the designs of machines of this type. For instance, the clamping and pressure dies may be advanced and retracted by a manually operated toggle or by direct acting screws. The mandrel retracting cylinder may be pneumatically operated. The form may be rotated by a motorized gear unit, using a reversible electric motor for the bending and return movements of the form. Any combination of these methods may be used, but the bending cycle itself remains the same.

Examples of Work Performed on Rotary Pipe-Bending Machines

The addition of specially built gages and fixtures to the machines may greatly reduce the time required in the mass production of bent parts. For example, a modern tubular metal chair may require eight bends on each chair frame. It is possible to so equip a machine that the position of the material at the beginning of each bend may be immediately gaged and the length of the bending stroke, that is, the angle of rotation of the form, may be automatically controlled for each bend by a series of stops synchronized with the eight bending operations. In this way, the operator simply starts the machine and returns the tools to the starting position after each bending cycle.

A second example of such bending is found in certain designs of automotive exhaust pipes where two bends may be adjacent to each other, with no straight part of pipe between them; but the two bends are in different planes, that is, they are at an angle to each other. Here, the special design is incorporated into the tools themselves. The first bend is produced in the usual fashion with standard tools. For the second bend, however, the clamping die and that part of the form which it engages, are replaced with special tools built to accommodate the already bent portion of the pipe. It is well, when planning such complex bends, to consult the bending machine manufacturer's engineers, as especially difficult and intricate parts have often been economically and successfully bent through such consultations.

Bending on Manually Operated Rotary Machines

Manually operated rotary bending machines cover a wide range of devices. The small conduit bender, which weighs about 5 pounds and is standard equipment in an electrician's kit, is one extreme of this range; the opposite extreme is the large manually operated bending machine of the type shown in Fig. 11. Yet both these machines are identical in principle and in fundamental design to the power-operated rotary machines. We find, again, a rotating form, a clamping die in constant relationship to it, and a stationary pressure die. On the larger types of manually operated rotary machines, provision is almost always made for a mandrel as well.

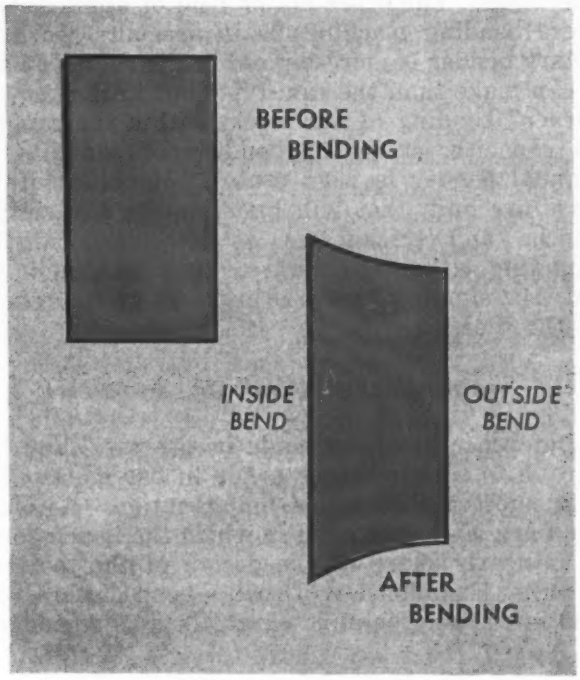


Fig. 12. Deformation of a Rectangular Bar in Bending to a Sharp Corner

The features in design that make these machines different from the power-operated machines are simply those that are affected by the change in the kind of applied power. The usual method of applying manual power is through a simple lever. Some machines, however, are built to bend heavier sections than can be bent by the use of a lever of any reasonable length. One such machine has a lever of the usual type for direct rotation of the form on light sections, but by a simple adjustment this lever can be converted to work through a ratchet wheel; this multiplies the pull on the rotating shaft, but correspondingly reduces the speed of operation. With machines so designed, a man can bend solid round bar steel up to 1 1/2 inches in diameter.

Application of Manually Operated Rotary Machines

Manually operated machines are sometimes used for mass production work involving light tubing and wire, where no great effort is required for each

operation. The other major field of application of these bending machines is in specialty work. A rotary bender is more limited in the radius of bend it can make than the ram type, but in the "square-corner" bending of bar stock, within the range of its capacity, or in the bending of conduits, the manual bender is very useful. Machines of this class are built that will handle quite a variety of widths and thicknesses of bar stock without changing either the form or the dies, and with only the simplest screw adjustment of the position of the dies.

Square-Corner Bends in Bar Stock

Reference has been made in the preceding paragraph to square-corner bends in bar stock. This is a subject that needs amplification. A square bend is a 90-degree bend in which the inside corner is as nearly sharp as the design of the tools will permit. Examination of such a bend discloses several interesting points. First, there is an indentation at the corner caused by the sharp edge of the form digging into the stock, and there is a small curve on each side of this dent. This is characteristic of bends made cold, and is caused by metal gathering on the inside of the bend. If the material were to be sawed through this indentation line, it would be noted that the cross-section, which was originally rectangular, has now become a trapezoid in which the longer side is on the inside of the bend, as indicated in Fig. 12. Special care must be taken in designing the tools for a bend of this character so that this deformation may be held to a minimum, but it will always be present to some extent in bends of this type.

Articles to follow in this series will deal with tools for bending, the hydraulic circuit for tube-bending machines, and factors to be considered in designing work for bending. [The Data Sheets in this number of MACHINERY list faults in pipe and tube bends and means of correcting them, as well as difficulties encountered in hydraulic bending machines, together with their solution.—EDITOR]

Cleveland Convention and Exposition of A.S.T.E.

THE plans for the fourteenth annual convention and the fifth annual exposition of the American Society of Tool Engineers to be held in Cleveland, Ohio, April 8 to 12, have now taken complete form. The exposition promises to be the largest of its kind ever held. Known as the "New Era Exposition of Production Equipment and Processes," it will comprise various types of equipment of interest to tool engineers in obtaining faster production, greater precision, and improved facilities in manufacturing.

The exposition will provide an opportunity for all interested in improved production methods to examine first-hand new methods and equipment developed in recent years to produce better goods at lower cost. Among the exhibitors will be some of the outstanding firms in the field of shop equipment, tools, and accessories; besides, many smaller concerns of more recent origin will exhibit the results of ingenious ideas upon which improved production methods of the future will, to a large extent, depend.

In addition to the exposition, the American Society of Tool Engineers has planned a number of technical sessions which will command the interest of those visiting the combined convention and exposition. Among the many subjects that will be dealt with the following may be mentioned: Plant Lay-out and Materials Handling; Economic Control of Quality and Fundamentals of Inspection Procedure; Cutting Fluids; New Techniques in Cutting Tools and Carbide Possibilities in Single-point Turning; Tool Engineering Education and Professional Development; Tooling for Permanent Molds; Relationship of Tool Engineering to Industrial Economics; Controls and Drives for Special Machines, including Hydraulic Drives, Mechanical Variable-speed Drives, and Electric and Electronic Drives.

Technical sessions will be held, Monday, April 8, Tuesday, April 9, and Wednesday, April 10, at 2 P.M. and 8 P.M.; Thursday, April 11, and Friday, April 12, at 2 P.M. The keynote of the technical sessions, as well as of the exposition, will be "How to produce goods at lower costs while industry is paying higher wages to the men who produce the goods."

A highlight of the exposition and convention will be the showing of technical motion pictures daily in a special theater in the Cleveland Auditorium. These films will deal with all types of tool engineering and related problems. Different films will be shown each morning of the exposition between 11:00 A.M. and 1:15 P.M.

As is the custom in connection with the Society's convention, arrangements are being made for members and other qualified visitors to inspect a considerable number of plants in Cleveland and vicinity. Such plant visits are being scheduled morning and afternoon daily, Tuesday to Thursday inclusive, and on Friday morning.

Thomas A. Burke, mayor of Cleveland, has sent a special welcome to all members of the Society and their guests.

Slotting Marine Bearings on Special Planer Type Milling Machine

A SPECIAL planer type milling machine was designed and built by the Ferry Machine Co., Kent, Ohio, for machining dovetail slots in propeller-shaft bearings used in naval and commercial ships. Rubber-bonded brass strips are inserted in the milled slots to form a bearing on which the shaft revolves.

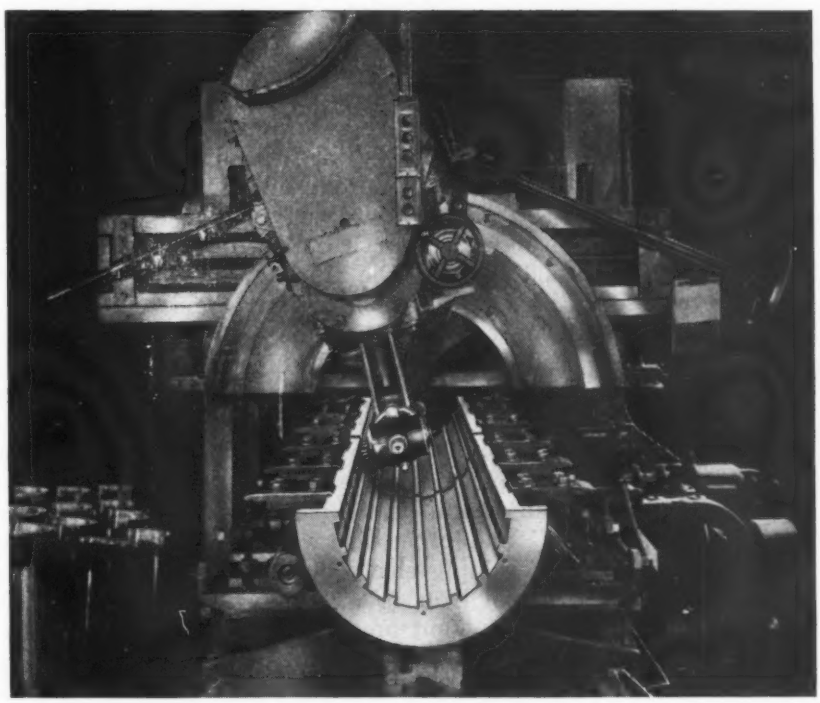
The machine has a capacity for bearings up to 10 feet in length with inside diameters that will accommodate shafts from 6 3/4 to 26 inches in diameter. The cutter-spindle housing, which can be seen in position for taking a side cut in the illustration, had to be made small in order to machine bearings with a small inside diameter. The confined space in the housing for gears, bearings, and spindle did not permit provision of internal adjustment for size or depth of cut. For this reason, the cutter-spindle housing was mounted on a neck-like extension or bracket, which was bolted to the bottom of a gear-box.

The gear-box was supported on the cross-rail by means of two adjustable slides, which were mounted at right angles to each other. These slides were actuated through lead-screws and gearing, and were equipped with handwheels graduated to 0.0005 inch. The gear-box and both slides swivel about the bearing shell in a plane parallel to the cross-rail. The swivel movement is obtained by means of two handwheel-operated worm-gears, one on each side of the machine. The cutter-head swivels in its housing, permitting the milling cutter to be used in three positions—vertically, and horizontally at both the right- and left-hand sides.

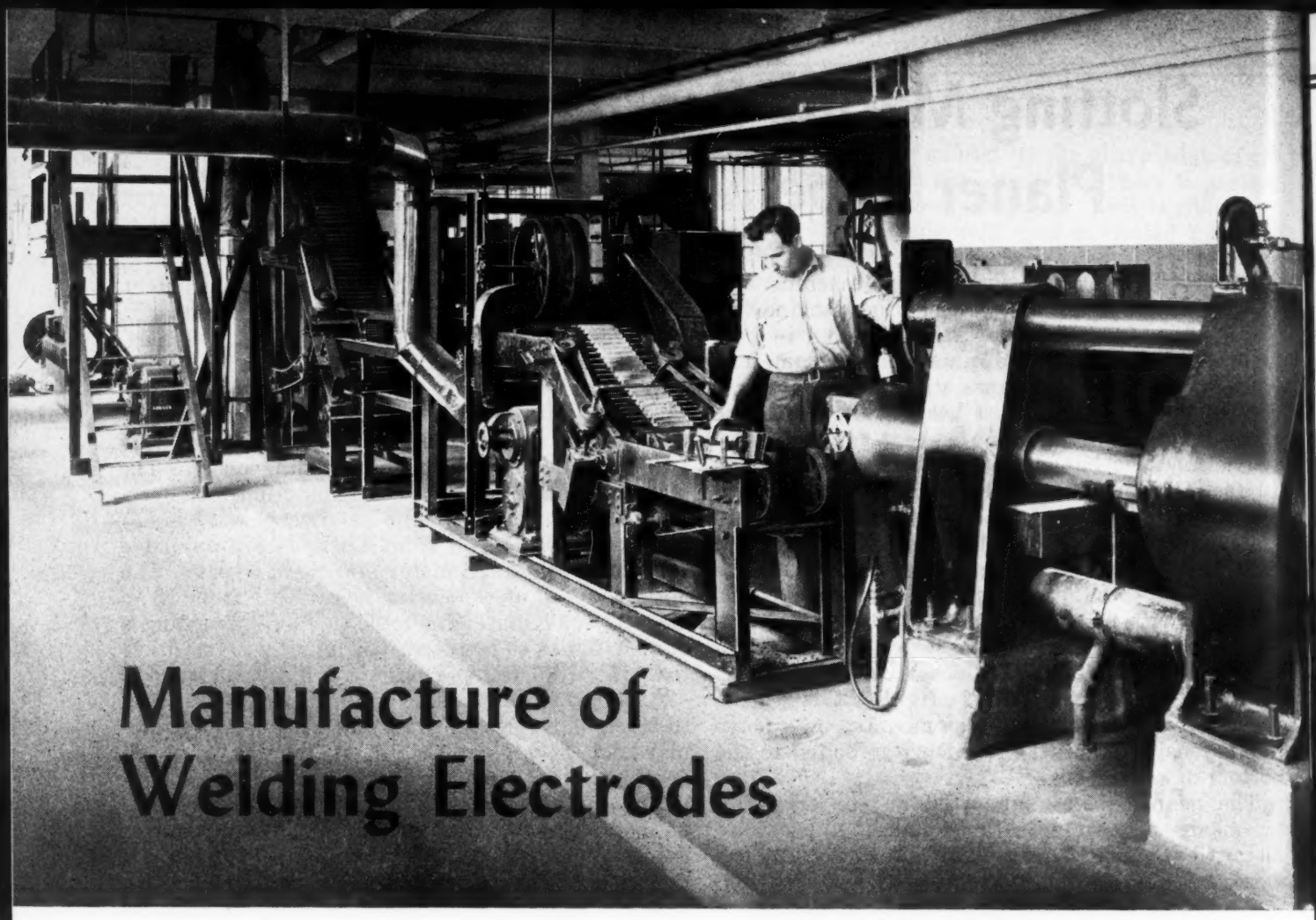
The work-holding fixture is constructed in three separate sections, with clearance between each section for the bearing flanges, to permit machining two or three small bearings simultaneously. The work-holding clamps of all three sections are operated simultaneously by one handwheel.

Sixteen changes in spindle speeds are available through a two-speed motor and change-gears. The surface speed of the cutter is variable from 75 to 425 feet per minute. The table surface speed ranges from 1/2 inch to 60 inches per minute. A fast table traverse of 50 feet per minute is also provided.

Carboloy inserted-tooth milling cutters are used to machine the Naval bronze bearings. A rectangular slot having full width at the top and full depth minus 0.040 inch is produced by the roughing cut, which removes approximately 2 1/2 pounds of metal per minute. A semi-finish cut removes the two V-corners and approximately 0.025 inch from the bottom of the slot. In the finishing cut, which is made at high speed, the cutter moves up one and down the other side of each slot, finishing the sides at right angles with the bottom and removing approximately 0.015 inch from the bottom of the slot.



Slotting Marine Bearings on a Planer Type Milling Machine with a Swiveling Cutter-head, Especially Designed for This Class of Work



Manufacture of Welding Electrodes

"Ni-Rod" and Other Electrodes are Now Produced on a Production Line Having a Capacity of over 1000 Pounds per Hour at the Bayonne, N. J., Works of the International Nickel Co.

ELECTRODES are used daily in numerous shops for the important arc-welding method of fabrication. The arc stability, fluidity of the metal in the electrode, bead contours obtainable on the work, and the physical properties of the deposited metal depend to a large extent on the materials and methods used in the manufacture of the electrodes. It is a major problem for an electrode manufacturer to consistently adhere to uniform standards. Automatic production lines, such as the one described in this article, help materially in the manufacture of electrodes that can be counted on to be reasonably identical without the need for complicated and costly qualification tests.

This production line was installed for the manufacture of "Ni-Rod" and other arc-welding electrodes. "Ni-Rod," a welding electrode for making machinable welds in cast iron, is a recent development of the Inco Development and Research Division's Research Laboratory, in cooperation with the Bayonne Works of the International Nickel Co. The "Ni-Rod" electrodes are produced in 1/8, 5/32, and 3/16 inch diameters.

Wire for the cores of the electrodes is received at the plant in 100-pound coils. The wire is straightened and cut on Lewis "Travel-Cut" machines, as shown in Fig. 1. This automatic rotary machine pulls the wire from the coil by means of power-operated rolls, straightens it, and cuts it. The mechanism for straightening the wire is a spindle containing staggered, adjustable guides, which rotates at approximately 5000 R.P.M. As the wire passes over the guides, it is bent alternately above and below the axis on which it is being fed, thus removing bends and kinks and leaving it straight. The cutting of any length required is controlled by the simple adjustment of a gage. The guillotine type shear reciprocates along the axis of the wire, moving with the wire while cutting, so that the wire does not stop moving during its cycle through the machine.

The straightened and cut rods are transported

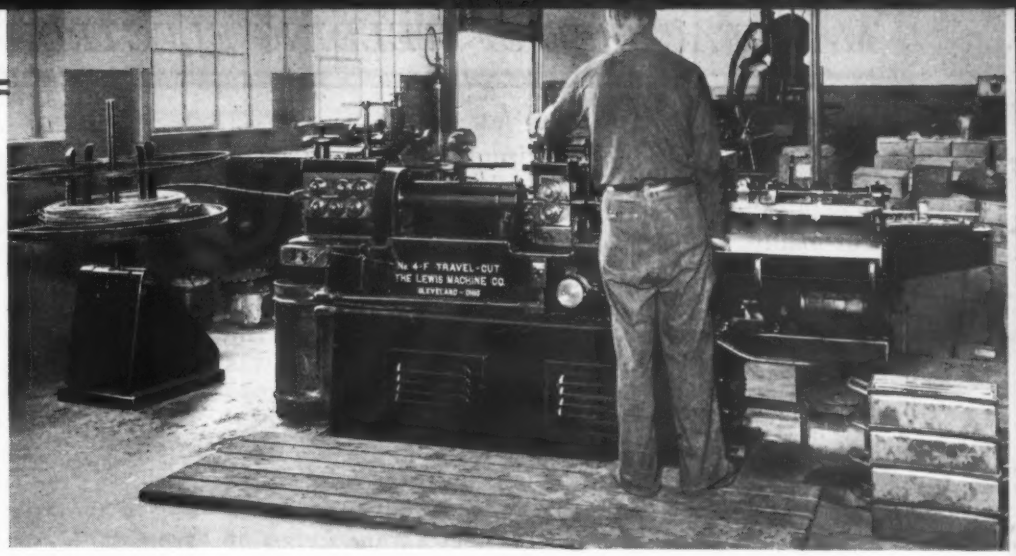


Fig. 1. Wire for the Cores of Electrodes is Pulled from the Coil, Straightened, and Cut to Length on This Rotary Automatic Machine

in tote pans to two Cincinnati No. 2 centerless grinding machines. Here the outside diameter of the wire rods is ground to size within a total accuracy of 0.001 inch. This grinding operation also removes burrs formed by the shearing, as well as any dirt and drawing compound left on the rods, and produces a surface that will hold the flux. No coolant is used for the grinding operation. A Roto-Clone air filter is provided for each machine to collect the dust.

The flux is first mixed dry. A wet binder is then added to the mixture, after which it is transferred to a Watson-Stillman vertical slug-forming press which exerts a pressure of approximately 3700 pounds per square inch on the flux. The flux is placed in a material chamber, and on the up stroke of the plunger, is compressed into a slug 5 7/8 inches diameter and 10 inches long; a completed slug is shown being removed from the press in Fig. 2. The flux slug is of a plastic consistency suitable for extrusion.

The flux slugs are then loaded into the material

Fig. 2. Slug of Flux being Removed from the Vertical Press in which it was Formed

Fig. 3. Flux Slug being Inserted into the Material Chamber of the Extruding Press

chamber of a 150-ton horizontal extruding press built by the Hydraulic Press Mfg. Co., as shown in Fig. 3. This method of using compressed-flux slugs for loading the extrusion press takes only two minutes compared with the seven minutes required when the uncompressed flux was placed in a steel cylinder and loaded into the material chamber by the ram. The steel cylinder method of loading was employed for all fluxes until the faster slug method was adopted. The extrusion press has a material chamber 6 inches in diameter by 30 inches long, so that three slugs can be held in one loading.

The hydraulic pressure of the extrusion press is adjustable for the various diameters and types of electrodes. The ram has a maximum travel of 46 inches, and is actuated by oil from a 1200-R.P.M. rotary pump, which delivers five gallons per minute. The pump is directly driven by a 7 1/2-H.P. electric motor. The extrusion press ram forces the flux through the material chamber and into the extrusion head which contains the sizing die.

The extrusion head changes the path of the flux 90 degrees prior to passage through the sizing die, in order to align the flux with the rods to be coated. The straightened, cut, and ground wire rods are fed into the extruding head by a machine placed directly in back of and in line with the extrusion die. The feeding machine is made by the Moslo Machinery Co., and is equipped with a Reeves variable-speed drive, which makes it possible to change the feeding rate from approximately 200 to 600 rods per minute.

The wire rods are placed in a magazine on top of the feeding machine, and are fed end-to-end into the extrusion die by means of power-operated tapered and grooved rolls. The position of the extrusion die is adjustable to make the core wire and surrounding flux concentric. This concentricity is checked frequently by the operator with a gage. Fig. 4 shows the flux-coated rods being discharged from the extrusion head onto a conveyor belt.

Two belts rotating on pulleys along the side of the conveyor align the electrodes for the stripping operation, which consists of automatically brushing both ends of the electrode with wire wheels. A width of approximately 1 inch of flux is removed from the grip end of the electrode by one set of wire brushes, and the other end is just trimmed by the second set of brushes.

Upon the completion of this operation, the conveyor line shown in Fig. 5 lifts the electrodes to the top compartment of the baking oven. The electrodes are again aligned by two belts, as shown, one on each side of the conveyor line, to insure

Fig. 4. Flux-coated Rods are Ejected from the Extrusion Die onto a Conveyor Belt

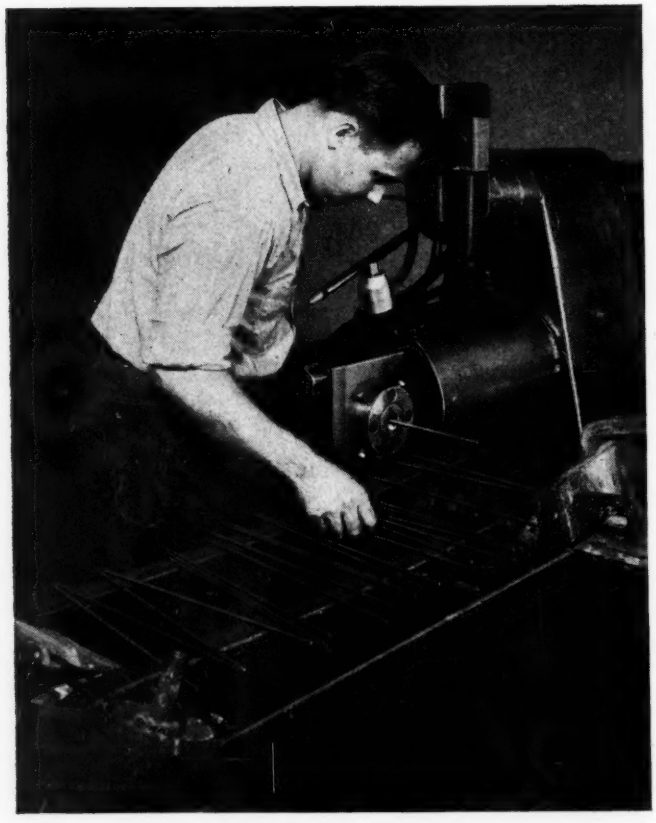


Fig. 5. The Conveyor Line Lifts the Electrodes to the Top Compartment in the Oven

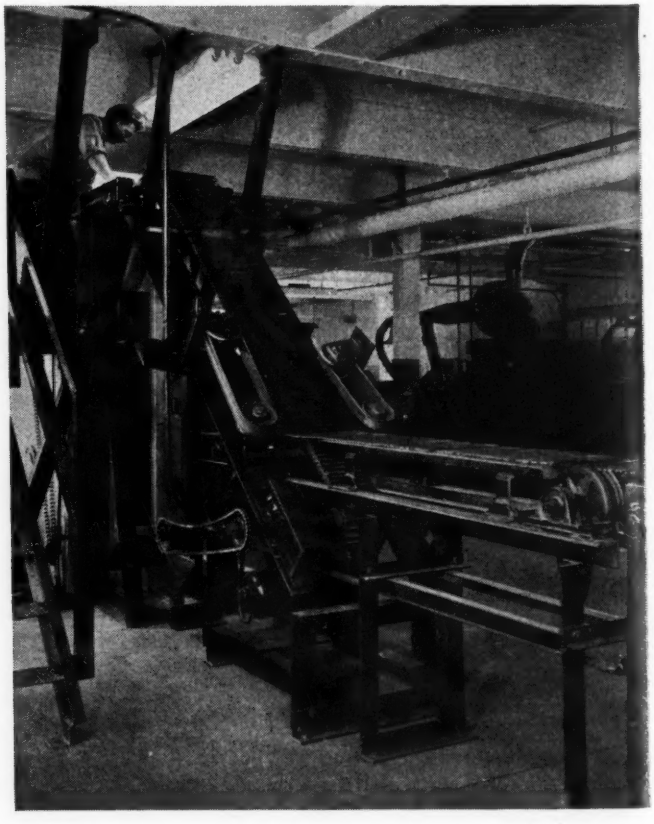


Fig. 6. Inspection of Electrodes as They Enter Oven on a Continuous Belt Conveyor

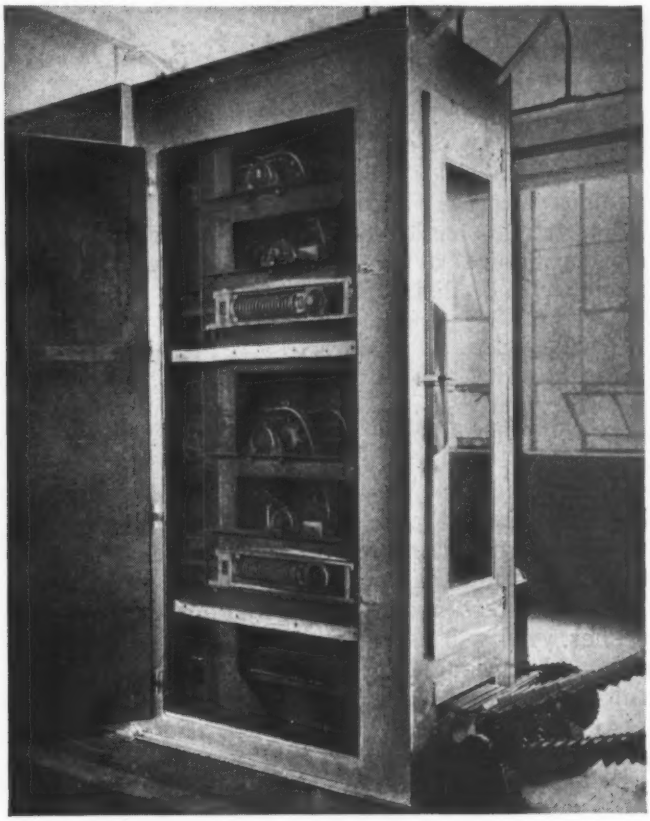


Fig. 7. View Showing Conveyors, which Carry Electrodes through Oven Five Times

proper alignment for entry into the oven. The man shown in Fig. 6 is inspecting the electrodes before they enter the oven.

This gas-fired oven is 90 feet long. Its temperature can be varied from 125 to 450 degrees F., depending on the production required and the type of electrode being processed. The coated electrodes pass through the oven five times on multiple-pass conveyors, which may be seen through the inspection door at the discharge end of the oven in Fig. 7. The humidity of the atmosphere within the oven is controlled by the automatic injection of steam when required. The speed of each pass of the conveyor is adjustable by means of Reeves variable-speed drives. In a typical cycle, the electrodes are heated 4 1/2 minutes in each of the first two passes, 9 1/2 minutes in the third pass, and 22 1/2 minutes in each of the last two passes, making a total heating period of 63 1/2 minutes.

At the unloading end of the oven, the electrodes are weighed and packaged. A representative sample from every batch is tested.

Increased Life of Automobiles per Dollar

ACCORDING to statistics gathered by the Automobile Manufacturers Association, the average life of automobiles in 1925 was 6 1/2 years. In 1945, the average life of passenger cars scrapped was 10 1/2 years. Twenty years ago, the average speedometer reading of cars scrapped was 21,750 miles. Today, this figure has risen to 81,000 miles. On this basis, when a man bought a new car in 1925, he paid, on an average, 4.4 cents per mile of the life of the car. In 1945, he paid only 0.9 cent.

The cost of repairs may have averaged more on a car driven 81,000 miles than on one that was scrapped twenty years ago at 21,750 miles, but there is a substantial margin between the original purchase price per mile to allow for a fair increase in the cost of repairs and maintenance.

The longer life of cars is attributed to better materials and increased experience in building, better repair and service facilities, better roads on which to drive, and greater driving skill.

Five Hundred Dollars in Prizes for Articles on Ingenious Mechanisms

MACHINERY offers $500 in cash prizes for the eight best articles on ingenious mechanisms to be submitted to the Editor before May 1 of this year. Each article should be confined to a description of one mechanism or one mechanical movement. The money will be distributed as follows:

One prize	$200
One prize	$100
Two prizes	$50 each
Four prizes	$25 each

In addition to these cash prizes, MACHINERY'S high-level space rates will be paid both for prize-winning articles and for all other articles accepted for publication that may not receive a prize.

Each contestant may send as many articles as he wishes. All will be entered in the competition and all may be accepted for publication; but no contestant will be awarded more than one prize.

Articles entered in this competition should be addressed to the Editor of MACHINERY, 148 Lafayette St., New York 13, N. Y. Remember that they must be mailed on or before May 1.

Preparing Articles for the Competition

This competition applies to any kind of mechanism making use of a practical and ingenious mechanical motion or principle. The competition is open to all, whether subscribers to MACHINERY or not. The general procedure is very simple.

1. Send a drawing of the mechanism (or photograph if preferred—or both) that clearly shows all important parts of the particular movement to be described.

2. Describe as clearly as possible both the *purpose* of the mechanism and its *action—how* it does *what* it does.

3. Mark the important parts on the drawing, such as levers, cams, etc., with letters *A*, *B*, etc., and use corresponding letters to identify those parts in the description; thus, "Lever *A* is operated by cam *B*." This will help to make the description readily understood.

4. Confine each article to a single mechanism or movement; do not describe an entire machine or refer to parts that do not affect the movement being described.

Suggestions about Illustrations and Manuscripts

Clear blueprints or pencil drawings with distinct lines are satisfactory for illustrations. They should be made on separate sheets of paper. Send only drawings that are to scale, with the various parts shown in correct relationship and proportion. Rough free-hand sketches cannot be used. The drawing must show the assembled mechanism, although a diagram or a drawing that is partly diagrammatic may often be substituted to advantage, especially if it more clearly illustrates the arrangement of a complicated mechanism.

It is more essential that important facts be clearly stated than that the manuscript be neatly written; but carefully prepared manuscripts usually indicate careful thought.

Avoid describing a mechanism that is familiar to most designers; descriptions of movements that are generally known cannot be accepted, even though they may be very ingenious. It is immaterial how long ago a mechanism or movement was designed, provided it has not previously been described in any publication or text-book.

Important Suggestions

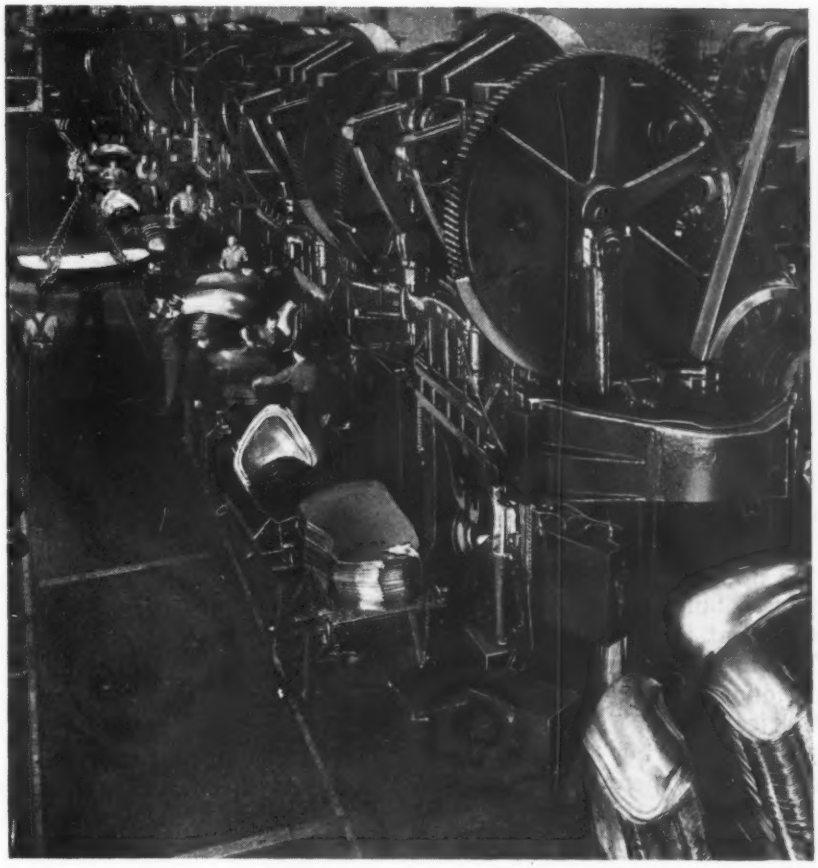
Be sure to describe as clearly as possible both the purpose of the mechanism and its action — what it does and how it does it. Describe the purpose first, and the means of accomplishing it afterward.

Confine each article to a description of a single mechanism or mechanical movement. Do not describe the entire machine of which the mechanism or movement is a part. Clear descriptions of separate mechanisms rather than descriptions of entire machines are desired. Omit reference to parts of the machine that do not affect the movement being described.

Do not describe mechanisms that are familiar to most designers. On the other hand, it is immaterial how long ago a mechanism or movement was designed: but it must not have previously been described in any publication or text book.

Selecting Drawing Compounds for Press Work

By JAMES McELGIN
E. F. Houghton & Co.
Philadelphia, Pa.



THE production of formed metal parts during the last few years has been marked not only by an increased output of familiar goods, but also by an amazing production of newly developed products. The wartime replacement of brass shell cases by those of drawn steel is one outstanding example. These new articles and production techniques have required, in many instances, additional research for compounds and lubricants for metal drawing and cutting, and new materials for heat-treating processes. The chemist, of course, had to keep pace with metallurgical improvements.

Despite the variations in the metal used, the fundamental requirements of a drawing compound are the same as they always have been. Obviously, all metals will not respond in similar fashion to the use of the same compound, due to a number of factors which will be mentioned subsequently. Basically, however, every metal demands the same characteristics in the compound by the aid of which it is being formed.

Primarily, the purpose of any compound is to facilitate the forming of the metal, whether the process be drawing, stamping, spinning, or punching. Some of the work may necessitate severe plastic deformation of the metal; some may be of a milder nature. Modern compounds are so treated as to adapt them for every degree of forming; and for many products, a single compound, diluted either in different proportions or with different diluents, can be used for all drawing operations on a particular alloy, whether the operation be severe or mild.

Importance of Film Strength in Drawing Compounds

The severity of the process determines the minimum requirements in the matter of film strength, one of the most important properties of the compound. The greater the deformation of the part being drawn, the higher must be the film strength of the compound, regardless of the metal used. Stainless steels usually require compounds of higher film strengths than carbon steels, brass, aluminum, and other non-ferrous metals, unless the milder alloys have been brought to a degree of greater hardness through heat-treatment or work-hardening.

The film strength is determined by the choice of basic ingredients and the alkaline saponification of the fatty materials used. It must be able to withstand the heat of the friction generated by the deformation of the metal. Pigments or fillers sometimes added to the various basic fatty ingredients increase the film strength and at times act as solid lubricants. As such, they prevent metal-to-metal contact, even in cases where the fatty lubricating film is ruptured.

Various mineral, animal, fish, and vegetable oils often are sulphurized or chlorinated to obtain greater strength of film. They may be used in such a "fortified" state or combined, in the form of soap, with minerals.

While the latter practice is frowned upon for general machinery lubrication, because of the speed of the moving parts, it is satisfactory for drawing operations, because the relative speed of the rubbing surfaces in drawing is much lower. Since the coefficient of friction is not held to a minimum, the presence of pigments is not objectionable, but, on the contrary, in many cases is most desirable. The filler must be carefully selected to

avoid the use of one that may be chemically active, highly abrasive, dangerous to the operators, or conducive to fermentation.

Oiliness of Compound and Friction between Die and Work

Another of the key essentials of a drawing compound is its oiliness or lubricity, to which might also be added its wetting-out properties. Friction between the die and work must be kept low, but zero friction is not to be considered a goal. A lubricant such as a straight oil or grease is not, in itself, a drawing compound. First, its lubricating properties may reduce friction to a point where it becomes too close to zero, at which point there is no control over the flow of metal as it is drawn. Such a condition results in excessive wrinkles and breakage, along with scored and broken dies. A certain amount of drag, to retard and restrict the flow of metal, is essential on difficult drawing jobs. Such control is not possible with an untreated lubricant.

What has been said is not intended to minimize the importance of the lubricity factor of the compound, but rather to emphasize the need for lubricity that is controllable with the aid of additives. The minerals and pigments would likewise be inadequate for the job if they were used without a lubricant. The fatty ingredients thus serve a dual purpose—acting first as a lubricant, and second as a medium to carry the necessary additives.

The lubricating properties and film strength are enhanced by inherent wetting-out properties in the compound, enabling it to adhere well to the work surface and increasing its ability to spread, under pressure, ahead of the working portion of the die to form a protective coating or film. The surface tension on which the wetting-out ability depends is controlled by the correct proportioning of saponified and unsaponified oil bodies.

Evaluating the Cost Factors in Selecting Drawing Compounds

The final requisite of the compound is its "real" economy, an all-embracing characteristic which must be weighed against its initial cost. The true evaluation of the cost includes numerous factors, such as effects on personnel, quantity used per unit of output, die life, work finish, corrosive tendencies, ease of mixing, removal from work, stability, and (with proper consideration of these other factors) the cost per pound.

Dissatisfaction among operators because of disagreeable or nauseating odors, toxic effect, or skin poisoning—any of which might be traceable to the compound used—is to be avoided, since labor unrest affects both the quality and quantity of work produced. Drawing compounds having none of these ill effects should be used whenever possible, even though the initial cost may be somewhat higher.

The compound cost per unit produced may be calculated on the dilution ratio used, the quantity of the compound applied, or both. Since final costs are based on the number of acceptable items manufactured, the percentage of rejections, spoilage, die life, machine time lost due to die changes, and other cost-increasing factors are included. It is common sense to conclude that a drawing compound which keeps these factors at a low rate is, in all probability, far more economical than one less efficient in this respect, even if the latter has a lower price tag.

A proper drawing compound has a marked effect in the prolongation of die life by smoothing the metal flow so that there is less wear on the die. Further, the plastic flow of the metal is so smoothed that a finer finish is obtained.

The use of any drawing compound that has a tendency to corrode or stain the work is not economical. Chemical reaction of sulphur on brass and of alkalies on zinc are examples; but cases such as these can be avoided through proper compound selection. The merits of any compound as regards rust inhibition should be evaluated with a view to ultimate economy in cost of production. Some compounds in the higher price brackets, because of their rust-preventive qualities, may be the least expensive.

It is also false economy to buy compounds that require much labor and equipment for mixing or removal. The cost of many hours of labor to dilute a drawing concentrate or to clean it from the work

Treatments for Modern Drawing Compounds

While drawing compounds have a mineral oil base, they include many more substances and treatments than the straight oil ordinarily used as a lubricant. For example:

Added Sulphur prevents welding.

Extreme-Pressure Treatment increases film strength.

Anti-Oxidant prevents rancidity and bacteria.

Pigmenting – the addition of inert material in finely dispersed form prevents metal-to-metal contact in the event of a rupture of the oil film.

Polar Compounds form a fixed molecular film which resists removal to a greatly increased degree, as compared with straight petroleum derivatives.

may considerably increase the actual cost of the compound. Likewise, costly equipment and materials may be required, thus increasing both installation and operating costs. Those compounds that may be left on the work without pitting, rusting, or staining or those that can be easily cleaned from the work should be selected whenever possible.

For satisfactory results, a compound must be stable and uniform. Decomposition in storage is one indication of instability, a bad feature often disclosed by rancid odors. Each lot and drum must be free from separation characteristics, not only in storage, but in the working process itself, where the high heat and pressures involved tend to cause a breakdown of the compound. Some compounds may be unable even to withstand temperature changes in storage without showing a marked difference in effectiveness.

The uniformity of the product as it is shipped from the manufacturer is also of the utmost importance. A product manufactured under close laboratory control has a much greater chance of producing uniform results than one made on a less closely supervised basis.

When all of the aforementioned factors are equal, the drawing compound may be purchased on the basis of price. When they are not equal, that compound which is ahead of the competitive brands on only one of these points may be the best suited and most economical for the job. "Real" economy is attained when a suitable compound causes a gain in quality or quantity of goods produced sufficient to offset price differentials.

* * *

Standardization of Ball and Roller Bearing Sizes

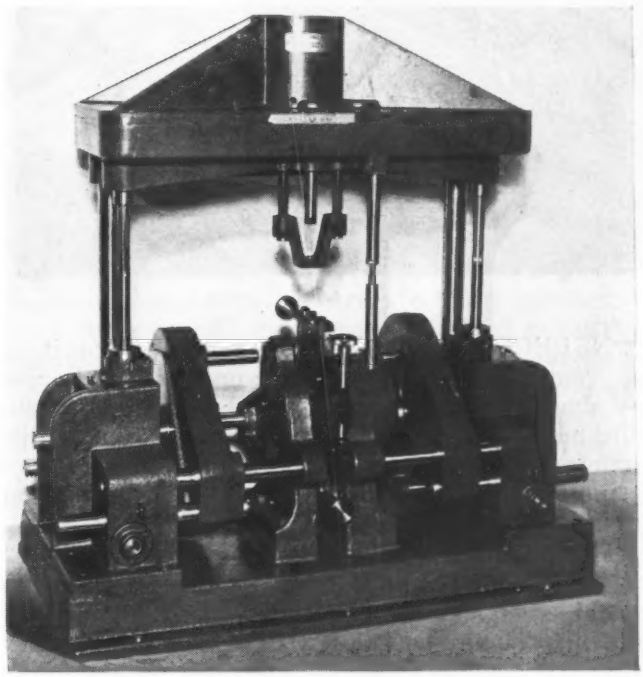
The nation's manufacturers are being urged to join in a movement to standardize the sizes of ball and roller bearings. This standardization, according to S. F. Wollmar, executive vice-president of the S K F Industries, Inc., Philadelphia, Pa., would reduce over-all costs, speed deliveries of ball bearings, and broaden American participation in world reconstruction.

Ball and roller bearing manufacturers are now required to produce and keep in stock as many as 40,000 sizes and kinds of anti-friction bearings. Some of these differ from one another only in the most minute details. If a uniform system of sizes were adopted, it might be possible to reduce the sizes and types to 2000. This would meet almost every industrial need without sacrificing quality.

Studies undertaken by S K F engineers indicate that bearing standardization would result in much speedier and more economical production and better service to the industries. These engineers declare that an international standards agreement, already reached, will simplify the problem of providing bearings for equipment needed all over the world; furthermore, foreign business of American manufacturers would be aided by standardization.

Drilling Seven Holes in Five Different Directions

High production rates were obtained by drilling seven holes in five different directions on a multiple-spindle drilling unit built for the Westinghouse Electric Corporation by the Hoefer Mfg. Co., Freeport, Ill. The main upper drilling and driving head, which was constructed with an aluminum body, is attached to the regular flange quill of the drilling machine. A single drilling spindle, with its guide bushing plate, is located in this head to drill one of the seven holes. Two vertical splined spindles, also mounted in this head, drive, through



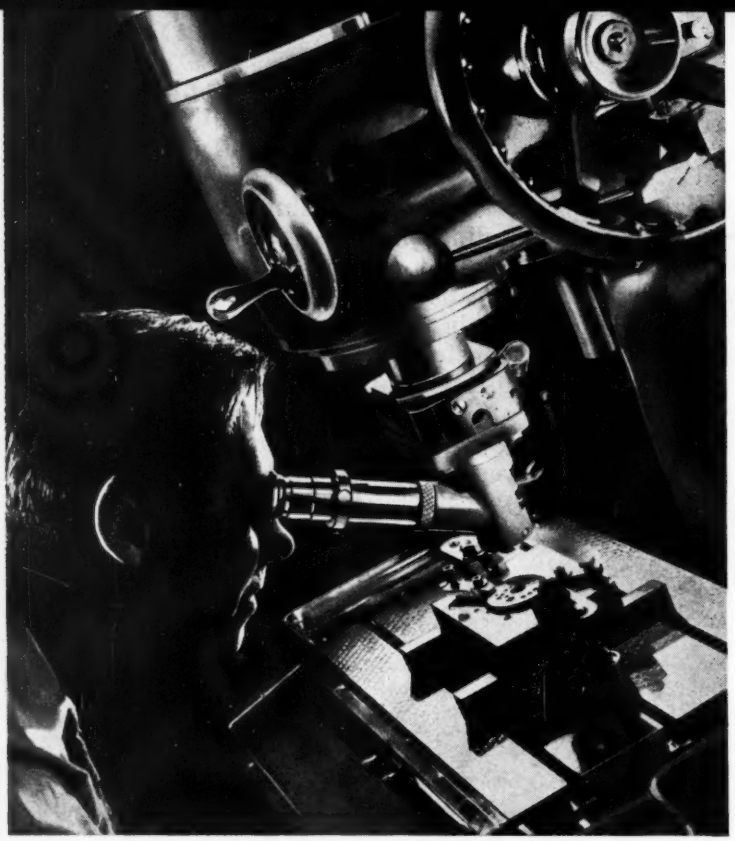
Multiple-spindle Unit Designed for Drilling Seven Holes in Five Different Directions

hardened helical bevel gears, two horizontal drilling heads. Each of the horizontal drilling heads contains three spindles.

The two horizontal heads are fed by vertical, hardened guide-bars, on which racks are cut to engage gear teeth in the horizontal cross-spindles, the ends of which are shown projecting from the left and right drive boxes. Two housings, carrying a four-station automatic indexing trunnion, are installed in the center of the base of the unit. Each face of the trunnion is arranged to carry two work-pieces, in different planes, for drilling the various holes in the directions required.

* * *

The United States Treasury Department permitted the use of $100,000,000 worth of silver as a substitute for scarce copper by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., in the construction of atomic bomb machinery.



Inspection on

Checking of Work before Removal from the Jig-Borer or Jig-Grinder Provides a Fast, Accurate Method of Inspection

INSPECTION of the work-piece before it is removed from the machine on which it is produced appears, at first glance, to be an inaccurate method of checking. It is the purpose of this article to show the feasibility, accuracy, and economy of this method as applied to jig-boring and jig-grinding machines.

The inspector should be called to the jig-borer or jig-grinder before the job is removed from the machine. He can then check the coordinate lay-out and inspect all the holes with an indicator faster than this could be done by any other means. The wide range of checking made possible by the use of a flexible indicator holding device is illustrated by Figs. 1 and 2.

It is advantageous on high-precision work to compare the checking of the finished work-piece in the jig-borer or jig-grinder with the results obtained by two or three other precision methods of inspection. All of the results thus obtained should be averaged before finally stating the probable errors.

The differences between the measurements obtained by jig borers or grinders and by other precision standards, especially when the dimensions being checked are small, seldom exceed 0.00005 inch. This amount is much smaller than the additional errors usually introduced by transferring the work-piece from one kind of measuring equipment to another.

One common practice in checking the location of holes is to place the work-piece on a surface plate, check the heights of inserted plugs, and compare them with a height gage or stack of gage-blocks. With this method, a considerable amount of calculation is necessary, in addition to the tedious work of making close-fitting plugs. The work-piece must also be turned 90 degrees to measure distances in the perpendicular direction.

A toolmaker's microscope, mounted on a compound slide, is an improvement over the surface plate and gage-block method. This improvement is due to its built-in movement in two directions and coordinate location system. The work-piece must be aligned with the microscope, however, when moving it from the jig-borer or jig-grinder to the compound-slide of the toolmaker's microscope.

A few comparisons will show that the jig-borer and jig-grinder are fully as dependable and accurate as any other shop inspection method. In fact, many cases are found where independent inspection makes an error appear much worse than it actually is. This is illustrated by Figs. 3 to 5, and will be discussed in detail later in this article. Errors in the independent system plus errors in positioning the work may accumulate to large proportions. Methods and results of checking should, therefore, be closely scrutinized before definitely rejecting jig bored or ground work.

There is considerable carelessness in everyday thinking and talking about dimensions and tolerances. The expression "within a tenth" is subject to different interpretations, and its use results in misunderstandings. "Within a tenth" might mean a total tolerance of a tenth (plus or minus a half-tenth from the nominal dimension) or a total tolerance of two-tenths (plus or minus one-tenth from the nominal dimension). Thus a difference of 100 per cent is found between the two interpretations.

The difference in interpretation could conceivably be much greater in the measurement of a master plate, gage, or drill jig with respect to the locations of several holes. In measuring the center distance between two holes, "within a tenth" might be interpreted, as stated, either as plus or minus a half-tenth from the nominal dimension or plus or minus one-tenth from the nominal dimension. However, the same two interpretations might apply to measuring the distance of each hole from a common reference point. The total range of error in this case might be as much as 0.0004 inch.

The following difficulties encountered in handling the physical equipment for inspecting or verifying the position of holes are for the most part eliminated, and in all cases minimized, when the jig-borer or jig-grinder is used for inspection.

Each hole must be "picked up" and related in some way to a standard of measurement. A rigid device, such as is possible for checking plug gages, cannot be used for measuring hole locations. Holes

Jig-Boring and Jig-Grinding Machines

By J. R. MOORE
Moore Special Tool Co., Inc.
Bridgeport, Conn.

can only be measured indirectly through the use of pins, indicators, or microscopes. One of the three following "pick up" methods is generally used:

First, by indicating directly on the surface of the hole. Unless the indicator approaches the hole from a direction in line with its center and can be rotated all the way around the hole, the point of contact, especially in small holes, is uncertain. If this is impossible, exact knowledge of the hole size is necessary. A plug gage must be fitted to the hole in order to determine its exact size.

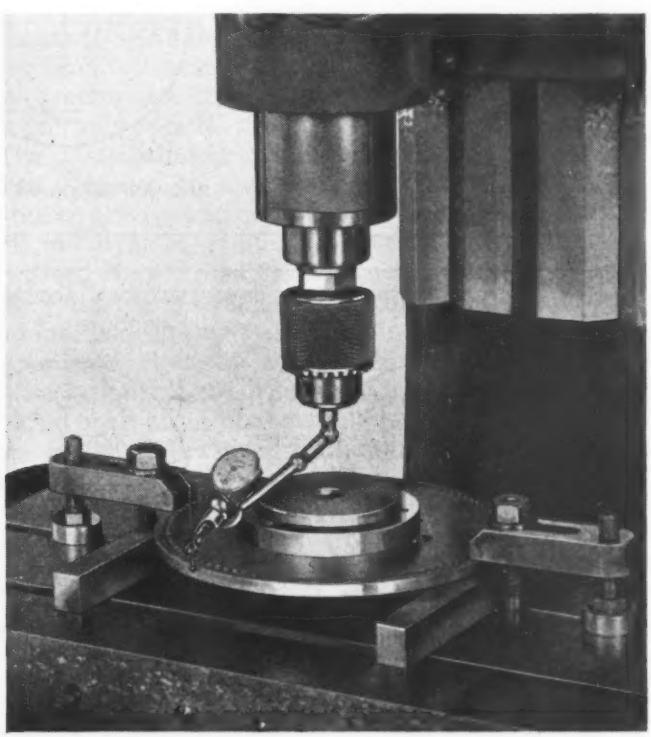
A second "pick up" method is by indicating one side of a tight-fitting plug gage. This method introduces the dangers that the plug or pin may not fit exactly, that it may be tipped in the hole, or that the hole itself may not be perpendicular to the surface of the work-piece. Extending this latter error to the outside of the work-piece by means of a plug only serves to accentuate the error. Occasionally holes are encountered that are too small to be indicated directly, but must be indicated by means of plugs in the holes. Even here there is an advantage in indicating the plug while the work-piece is mounted on the jig-borer or jig-grinder, because the spring of the plug, caused by the indicator pressure, is the same in all directions and cancels itself. The spring of the plug in a work-piece mounted on an angle-iron, however, cannot be canceled out because it always occurs in the same direction and by an unknown amount.

The third general method is to "pick up" the edges of the hole optically by means of a microscope containing a ruled reticle, as shown in the heading illustration. This method eliminates the use of indicators or other spring tension devices, but has the disadvantage that only sharp corners can be observed accurately. Two or more observations by this method seldom agree within plus or minus a half-tenth or a tenth, even after lapping the hole and surface of the work-piece to produce a clean, sharp edge. There are many cases, however, where a microscope is a decided advantage. Examples af such cases are small and irregular-shaped parts, and holes too small to approach with an indicator. For this reason, jib-borers and jig-grinders are usually equipped with a microscope, enhancing their value as inspection machines.

After "pick up" of the hole, it is related to a

Fig. 1. Checking a Hole by Means of a Dial Indicator Mounted in the Spindle of a Jig-boring Machine

Fig. 2. Checking the Periphery of the Work-piece by Means of the Same Set-up as Shown in Fig. 1



measurement standard. One of the three following methods is generally used for this purpose:

First, by inserting a stack of gage-blocks between two plugs or pins protruding from the holes. This method is direct, and is accurate if done skilfully. The greatest danger is the springing or spreading of the pins. The disadvantage is that it measures position in only one direction, along the chordal dimension, and does not check the angular relation of the holes.

A second method of measurement is by standing the work-piece on its edge or strapping it to an angle-iron and referring all locations to a surface plate by transfer across the tops of fitted plugs, through the indicator and stacks of gage-blocks. The location of each hole is determined by an individual measurement to the surface plate. The relation between any two holes is found by subtracting one of these measurements from another. This has the disadvantages of the errors previously mentioned and the fact that it checks the holes in one direction only, requiring accurate rotation through 90 degrees to check the perpendicular dimensions.

A third method is by strapping the work-piece to a coordinate location device, such as the toolmaker's microscope, jig-borer, or jig-grinder, and "picking up" the holes with the indicator or microscope. Each hole is thus related to the coordinate location system, and the holes are checked in two directions at the same time.

A frequently encountered pitfall is that of assuming some specific hole or row of holes as the starting point. It often happens that all dimensions on a given drawing are built up from a basic center line or base line. For this reason, holes on this line are usually the first ones "picked up." However, there is fully as much danger of error in "picking up" these holes as there is in "picking up" any of the others. The theoretical base line, therefore, must be established from the average of the errors of all the other holes, and can not be definitely determined until all of them have been checked. Usually it is necessary to change the position of the work-piece with respect to the theoretical base line to assign final errors against each hole.

If a hole is off location plus or minus 0.0001 inch, and the inspector makes an error of plus or minus 0.0001 inch in checking it, the range of possible error is again increased. A hole actually off 0.0001 inch might appear to the inspector to be in error 0.0002 inch, and be rejected. Inversely, a hole that appears off 0.0001 inch to the

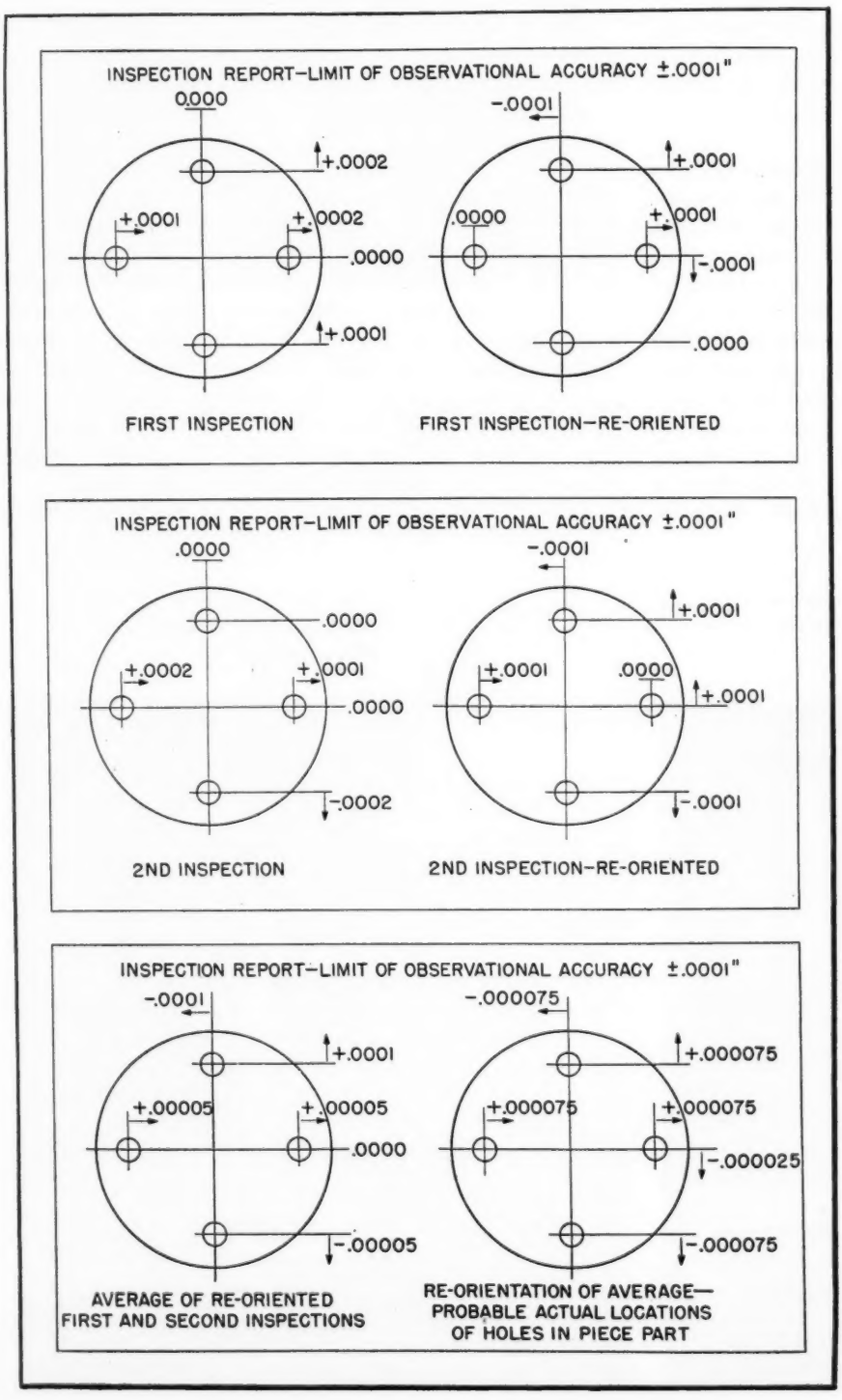


Fig. 3. (Top) Chart Representing Results of First Inspection of Work-piece. Fig. 4. (Center) Chart Representing Results of Second Inspection of Work-piece. Fig. 5. (Bottom) Chart Representing Results Obtained by Averaging the First and Second Inspections and Shifting Work-piece

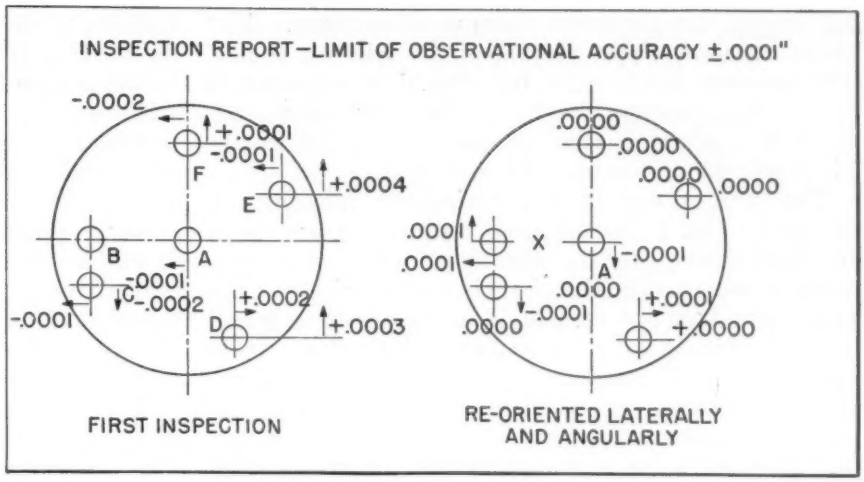


Fig. 6. Chart Showing, at Left, Results of the First Inspection, and, at Right, Effect Obtained by Shifting and Rotating the Work

inspector might actually be off 0.0002 inch. If this extreme exists in opposite directions on two holes when referred to a common base line, they might be off, relative to each other, plus or minus 0.0004 inch. This would produce a total tolerance of 0.0008 inch between the two holes.

A simple example of the necessity for altering the position of the work-piece is represented by the inspection charts shown in Figs. 3 to 5. In each case, the horizontal center line was used as a base to check all vertical distances, and the vertical center line as a base for all horizontal distances. The deviations indicated on these figures are those found by the inspector. Substantial differences between the first and second inspections are to be noted.

Some of these differences may be assumed to be the result of errors in "picking up" the base holes. For example, if the work-piece had been set up the first time 0.0001 inch lower and 0.0001 inch farther to the left, the inspection results would have appeared as shown in the sketch "First Inspection Re-oriented," shown at the right of Fig. 3. Similarly, it appears that in the second inspection, the work-piece should have been placed 0.0001 inch higher and 0.0001 inch to the left. Transposing the work-piece in this manner would have produced results shown in the sketch "Second Inspection Re-oriented," shown to the right of Fig. 4.

Averaging the two re-oriented sketches shown at the right in Figs. 3 and 4 produces the figure shown at the left of Fig. 5, which indicates that the position of the work-piece should be again shifted 0.000025 inch to the right and 0.000025 inch lower to produce the sketch shown at the right of Fig. 5. This figure shows the probable true locations of the holes. This cannot be stated with any definite degree of certainty, however, since measuring equipment is assumed to have an observational limit of accuracy of plus or minus 0.0001 inch.

In most cases, it is also necessary to relate all holes to the periphery of the work-piece or to an edge. This supposition has been omitted from the foregoing discussion to avoid confusion. This example represented errors of "pick up" in the same directions only. If errors in "picking up" the two holes on the base line are made in opposite directions, a larger exaggeration in some apparent errors might result.

Directions of the errors shown in the sketch to the left of Fig. 6, for example, show that the work-piece should be moved to the left, and at the same time, rotated clockwise. The nature of the errors indicates that the reference holes *A* and *B* were misaligned in different directions when the "pick up" was made. The work-piece should be rotated approximately around point *X*, so that hole *B* is moved upward and hole *A* moved downward. The resultant chart of errors would then appear as shown in the sketch at the right of Fig. 6. The largest errors have now been canceled; those that remain might be either errors in fabrication or inspection, or an accumulation of both. It should not be assumed that altering the position of the work-piece is a sufficient safeguard to insure accuracy of inspection. Each measurement should be taken enough times to derive a reasonable average.

In the preceding examples, it has been assumed that the work-piece has been removed from the jig-borer or jig-grinder. It is for this reason that so much time is required for inspection. If the work-piece is checked directly on the jig-borer or jig-grinder, this loss of time is largely eliminated.

The assumption is often made that the measurements obtained in checking a work-piece on the jig-borer or jig-grinder will be the same as those made in boring or grinding it on the same machine. However, they probably will not be exactly the same. During operation as a boring or grinding machine, the jig-borer or jig-grinder is subject to temperature changes, strains from cutting tools, and vibration, all resulting in minute changes from the true position. A change will sometimes be noted if the indicator is moved from one side of the spindle to another. This results from out-of-roundness of the spindle, and, although minute, when added to other errors, it can actually be measured. For this reason, the indicator should always be held in the spindle so as to face in the same direction as the cutting or grinding.

While no cutting is being done, the machine will be free from vibration and stresses, and since the inspection is done during a short period of time,

no serious temperature changes take place. For these reasons, some discrepancies will be found. The amounts are minute, but should be expected to be, on the average, mostly in the same direction, so that a slight change in position of the work-piece will usually cancel the errors.

Use of a rotary table for circular indexing, as shown in Fig. 7, introduces additional errors, both in fabrication and in checking. Operators frequently notice that the checking of work on a rotary table does not seem to be as accurate as when done by means of rectangular coordinates. It is believed to be impossible to attain as accurate location by indexing as by rectangular coordinates, no matter how accurately divided the rotary table may be. Errors in the rectangular coordinate location system must be included even when using the rotary table, since distances from the center of the table are measured by rectangular coordinates. Errors due to temperature changes and machine vibration must also be included, the same as with the rectangular coordinate system.

In using the rotary table method, several other errors may occur (1) in "picking up" the center of the rotary table with respect to the machine spindle; (2) in "picking up" the center of the work-piece with respect to both the rotary table and machine spindle; (3) in the dividing system: and (4) in reading the graduations of the dividing system.

The effect of any of these errors may be doubled because of the principle of rotation. For example, if the center hole of the work-piece is eccentric relative to the rotary table by 0.0001 inch, the holes on one side of the circle will be 0.0001 inch too close to the center hole, while those on the opposite side will be 0.0001 inch too far away. The difference between these distances will be 0.0002 inch. In some cases, all the errors mentioned might occur in the same direction, and thus would accumulate to large amounts. For these reasons, it is better to employ the rectangular coordinate location system on precision work and eliminate these additional sources of errors. If the rotary table method is used, extreme care should be taken to keep each individual error at a minimum.

Misinterpretation of statements of accuracy apply to rotary table divisions, as well as to rectangular measurements. Expressions are frequently heard referring to angular divisions such as "within five seconds," or "within a tenth, on an 8-inch diameter." The expressions "within plus or minus 5 seconds" and "within plus or minus 0.0001 inch on an 8-inch diameter," should be used.

The same care should be exercised in selecting a reference hole, or angular zero, for rotary table checking as in selecting any hole or row of holes as a reference in rectangular measurements. The same method of establishing this reference point should be followed as was described for the rectangular coordinate system.

It sometimes happens that two or three hole-location gages, or jigs, may be made exactly alike. They can be checked against each other by pushing snug fitting pins through all the holes in both plates. This is somewhat effective, but has its drawbacks. There must be superior workmanship in all holes, and the pins must not be appreciably loose; otherwise the method is deceptive and the test has no significance. Very little force is required to bend or spring the pins, which would permit the plates to go together and the pins to be moved, although the locations might be incorrect. At best, the plates are merely compared, no reference being made to any standard of measurement.

The most dependable check is made by placing the piece in some rectangular locating system and indicating each hole all around, over its entire surface. The system best suited to this is that offered by the jig-borer. The toolmaker's microscope is also excellent, of course, provided that all the holes have finely finished sharp edges.

The operator may be confused between out-of-roundness and out-of-location. When he makes a setting and finds the indicator reads 0.0002 inch higher on one side of the hole than on the other, his first reaction may be to assume that the hole is out-of-round by that amount. Mov-

Fig. 7. Work-piece being Checked by Means of a Dial Indicator and Rotary Table Mounted on a Jig-grinding Machine

ing the table slightly to correct the location might make the readings all equal, showing that the hole was merely off in location rather than out-of-round.

The recommended practice for checking is to set the table position so that the indicator reads true all around the hole. Next, run the indicator up and down in the hole to attain a good average setting. Then compare the actual table settings with the calculated coordinates to which settings were made during fabrication. The differences between these figures represent the actual errors.

Owing to the causes previously mentioned, slight errors will sometimes be found. As a rule, they will all be in one direction—all plus or all minus; this means that a temperature change has moved the whole coordinate location system during the time between machining and inspecting. These errors are canceled by altering the position of the work-piece.

The jig-borer or jig-grinder is being used as an inspection device in many plants A great saving in time is accomplished by this practice, and accurate results are obtained in a more direct manner, as previously stated. Some machines have been installed without the motor and drive mechanism, thus preventing their use for any purpose except inspection.

In addition to saving time, the use of jig boring and grinding machines greatly increases the capacity of the tool inspection department. Considerable inspection equipment is still necessary, of course, but a good deal of it is supplanted by the use of the jig-borer and jig-grinder as inspection machines. [J. R. Moore, the author of this article, is also the author of a forthcoming book to be entitled, "Precision Hole-Location for Interchangeability in Toolmaking and Production."—EDITOR]

* * *

Industrial Diamond Association

To promote the development of the diamond tool industry, a new trade association has been formed by a group of leading industrial diamond firms. The organization will be known as the Industrial Diamond Association of America, and will have headquarters at 501 Lexington Ave., New York City. Athos D. Leveridge, formerly chief of the Diamond Dies Section of the War Production Board, has been named executive director and secretary-treasurer of the Association; the president is Harvey B. Wallace, president of the Wheel Trueing Tool Co., Detroit, Mich.; first vice-president, I. J. Meade, vice-president of the U. S. Industrial Diamond Corporation, New York City; second vice-president, Charles J. Koebel, president of the Koebel Diamond Tool Co., Detroit, Mich.

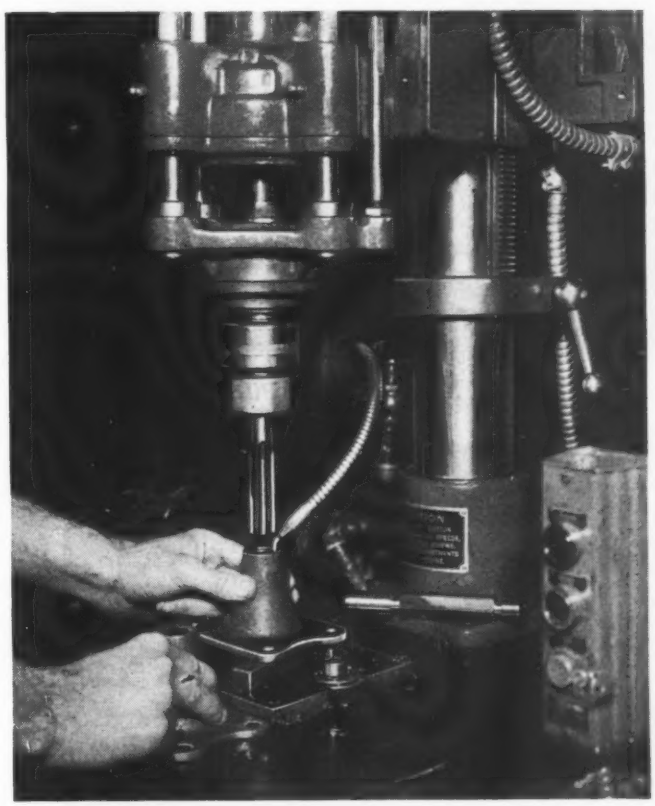
* * *

If we are to have any real prosperity that will last, labor must take up its "featherbeds" and walk.—*Merlyn S. Pitzele*

Threaded Spring Hangers Tapped in Eight Seconds

A new type automotive spring hanger has a thread design that provides greater area to resist radial and thrust loads. The thread is of straight-sided obtuse form, with a pitch diameter of 0.893 inch, 11 threads per inch, and an included angle of 149 degrees 43 minutes. It is claimed that the new type hangers will simplify the mounting of truck springs, because axial adjustment for frame alignment is possible, spring eyes can have wider axial tolerances, locking devices are eliminated, a limited oscillatory movement is permitted, and the engagement of new contact surfaces to compensate for wear is possible.

These hangers are tapped in eight seconds, floor-to-floor time, in the plant of the Chapman Products Co., Detroit, Mich., on a light-duty tapping machine built by the Detroit Tap & Tool Co. The operation consists of tapping to a depth of 1 45/64 inches with a standard Detroit six-flute tap ground with a four-thread chamfer. The tap is mounted in a floating tap-holder, and the work is placed on a two-pin locating fixture without clamping. This lead-screw type of machine eliminates the tendency for the tap to bind on the return stroke and makes clamping unnecessary. The tapping cycle is semi-automatic (tap, return, stop) to assure positive feeding at the high spindle speed of 400 R.P.M. used. Tap life of 5000 pieces between grinds is obtained even with the close tolerances required.



Tapping the Bearing Surfaces of Truck Spring Hangers on a Detroit Lead-screw Tapping Machine

Fig. 1. Result of Normal Wear

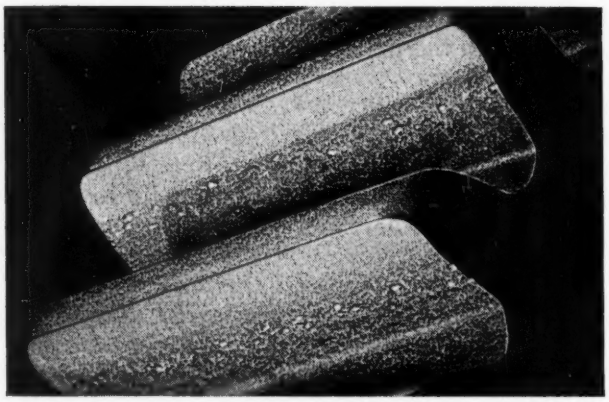


Fig. 2. Initial Pitting

Fig. 3. Progressive Pitting

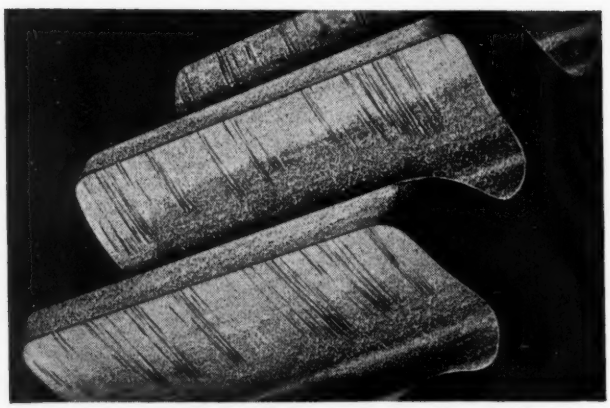


Fig. 4. Abrasion or Scratching

Gear Tooth Wear

SOME time ago, the American Gear Manufacturers Association adopted a nomenclature standard entitled "Standard for Terms used in Designating Gear Tooth Wear and Failure." Since this data has not been widely distributed outside the gearing industry, it is believed that information pertaining to this standard will prove of value to the mechanical industries in general.

The prime object of this nomenclature standard is to describe terms used to explain different types of tooth wear and failure, and thus avoid any misunderstanding regarding terminology that might arise between manufacturers and users of gears. It should be pointed out that properly designed and manufactured gears, unsatisfactorily mounted, improperly lubricated, or otherwise incorrectly applied, as listed below, may fail in operation.

(a) Incorrect center distance, resulting in insufficient root clearance and backlash.

(b) Misalignment; excessive shaft deflection; defective related parts; worn bearings, etc.

(c) Incorrect or insufficient lubrication.

(d) Foreign matter in lubricant and between teeth, such as abrasive dirt or particles of metal worn from teeth.

(e) Excessive temperatures.

(f) Excessive loads, or shock loads.

(g) Vibration.

(h) Excessive speeds.

(i) General abuse.

The conditions summarized above result in various types of gear tooth surface wear and failure through breakage. The phenomena of gear tooth wear and failure have been designated by different terms to classify and identify the tooth surfaces resulting from varying operating conditions. While the appearance of the tooth surfaces is identified by various terms, it should be explained that there is in many cases a marked similarity. For instance, abrasion and scratching is largely a difference in degree of roughness of the surface. Other kinds of wear, at the start, may be of a minor nature; but if the conditions become more severe, the resultant effect on the tooth surfaces may be of a different nature and appearance. This is particularly true of scoring, which, under severe conditions, leads to galling, seizing, and welding.

The type of failure and its appearance are definite functions of the material and operating conditions. In reporting or describing failures, all the related facts should be included. For instance, chipping and spalling have an appearance similar to a fatigue failure, and unless all the facts are known, one condition may be confused with the other.

The terms relating to gear tooth wear and failure adopted as standard are described and pictorially presented in the following.

Normal wear, Fig. 1, refers to the gradual

and Failure

smoothing and polishing of the working surfaces resulting from the sliding and rolling action of the teeth. It is frequently spoken of as "running in." With proper design, manufacture, and operation, a condition is reached after which wear practically ceases.

Initial pitting applies to the formation of small pits, as large as the head of a pin or smaller, in the tooth surfaces, usually starting in the vicinity of the pitch line and frequently occurring during the initial period of gear operation. (See Fig. 2.) Pitting should not be considered detrimental unless it advances beyond the initial stage. If pits occur gradually and do not increase rapidly, they indicate a temporary condition, and may disappear entirely in the course of normal wear.

Progressive pitting, Fig. 3, is a type of failure that is indicated when the formation of pits continues at an increasing rate, both as to number and size. A point may be reached when the unpitted areas of the tooth surfaces are insufficient to carry the load, and complete destruction of the tooth shape may occur, especially after continued operation at relatively high load or overload.

Abrasion, Fig. 4, may be described as a general wearing away of the tooth surface at a comparatively rapid rate. It usually results from the presence of foreign matter, such as dirt, grit, or metallic particles in the lubricant. It may also be caused by a breaking down of the material on the tooth surfaces, as for instance in cast-iron gears. Abrasion appears as fine scratches up and down the tooth profiles, closely distributed over the surfaces. Lack of proper lubrication may result in abrasion.

Scratching is similar to abrasion, except that the marks are deeper and more widely separated. It occurs when comparatively coarse particles are carried between the engaging tooth surfaces.

Scoring, Fig. 5, results from excessive loading or inadequate lubrication. Scoring may occur even in gears that have been properly designed, manufactured, and installed when the conditions of operation are such as to cause metal-to-metal contact. The tooth surfaces may be roughened only on small areas and at the same position on all teeth. This may be followed by a general disintegration of the surfaces, if abnormal conditions of operation are continued. Scoring may sometimes be eliminated in its initial stages by applying more effective lubrication, such as the substitution of a general-purpose E.P. lubricant.

Galling, Fig. 6, is an aggravated condition of scoring, caused by particles of metal torn out from the tooth surfaces in a manner that is sometimes referred to as "seizing" and "welding." This condition is more likely to occur when two comparatively soft gears of the same hardness are operated together under heavy load.

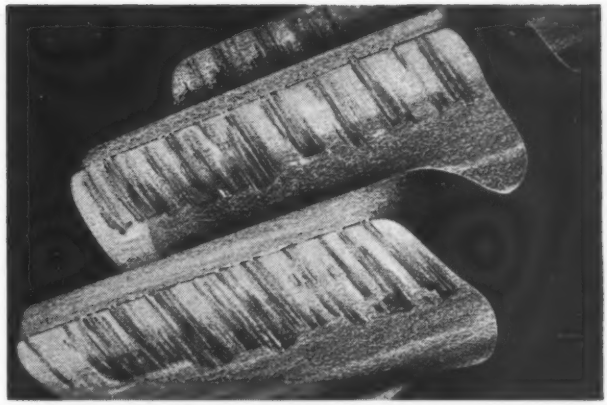


Fig. 5. Scoring

Fig. 6. Galling

Fig. 7. Burning

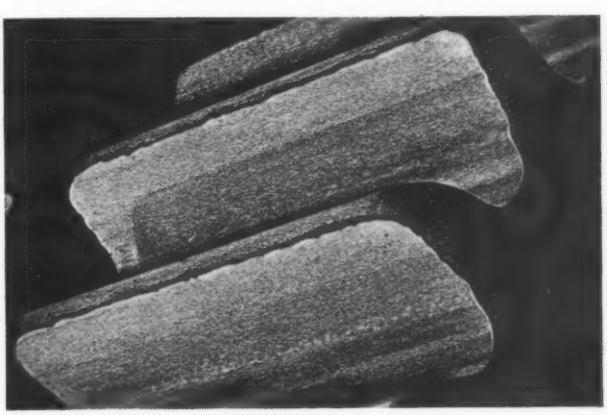


Fig. 8. Rolling and Peening

Fig. 9. Cracking and Checking

Fig. 10. Chipping

Burning is indicated by discoloration of the tooth surfaces of the type associated with high temperatures. (See Fig. 7.) Such discoloration shows that excessively high temperature has actually occurred; it may be due to overspeed, overload, or faulty lubrication. Burning may result in a reduction in the hardness of hardened steel gear teeth and worm threads, making them unsuited for carrying the specified load.

Rolling and *peening* are terms that refer to a plastic flow of the tooth surfaces, Fig. 8, which may occur when the material in the gears is ductile in compression and of insufficient hardness. Scoring may or may not be present. One effect of rolling is the formation of slight fins at the top edges and ends of the teeth. Rolling refers to that condition where plastic flow takes place due to heavy continuous loading; peening where the load is intermittent, resulting in a plastic flow of the material due to "hammer blows."

Cracking refers to the occurrence of single or scattered cracks in the tooth surface which do not necessarily result in failure. *Checking* refers to the formation of numerous and closely grouped cracks in the surface. (See Fig. 9.)

Cracking may result from loading and lubricating conditions causing excessive temperature fluctuations and also from excessive hardness. Checking may result from several causes. The direction and arrangement of the cracks and checks usually indicate the probable causes. Frequently, cracks and checks can only be detected by etching or by the "Magnaflux" method. For cracks in fatigue failures, see *fatigue breakage.*

Chipping, Fig. 10, refers to the breaking off of portions of material at the edges or boundaries of the teeth. It may indicate excessive brittleness when it occurs under normal load. Another term indicating this condition is *spalling.*

Gouging, Fig. 11, may occur in unhardened gears when there is interference between the flank of the driving pinion and the tip of the driven gear. The top edges of the gear teeth may gouge the material near the roots of the pinion teeth. A similar effect may occur between the edge of a hardened worm thread and the teeth of a worm-gear.

Overload breakage is a term that refers to gear tooth breakage caused directly by an unexpected shock or overload—due, for instance, to the jamming of other machinery—of a nature that cannot be attributed to improper design or faulty manufacture. (See Fig. 12.)

Fatigue breakage refers to tooth breakage as a result of repeated loading, and is usually characterized by the formation of cracks at highly stressed locations, which progressively extend in area and depth until failure occurs. (See Fig. 13.) Fatigue breakage is not necessarily an indication of poor design or faulty manufacture. It merely means breakage after a large number of repetitions of

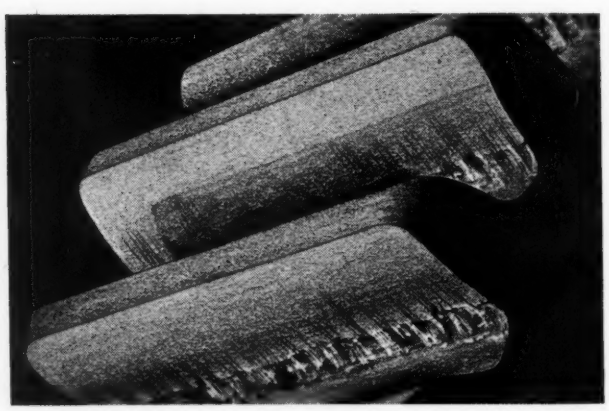


Fig. 11. Gouging

Fig. 12. Overload Breakage

Fig. 13. Fatigue Breakage

load, as distinguished from overload breakage, which may be the result of a single application or a comparatively few applications of excessive load. It is usually possible to ascertain from the character of the surfaces of the fracture if the failure is from fatigue.

* * *

A National Labor Policy to Minimize Industrial Strikes

The first comprehensive management program in history intended to establish a national labor policy in the public interest has been presented to Congress by Ira Mosher, chairman of the board of the National Association of Manufacturers. This program constitutes management's recommendations to minimize strikes and achieve permanent labor peace. The recommendations are as follows:

1. If a dispute is not settled by collective bargaining, conciliation, or voluntary arbitration, it should be the obligation of the parties to give the governor of the state in which the dispute is pending ten days' notice before any strike or lockout.

2. In cases where a strike or lockout would constitute a public emergency or endanger the health or safety of the public, the governor should be empowered to appoint a fact-finding panel.

3. In cases where a national emergency is involved, or national health or safety is endangered, the President of the United States, upon his own motion, should be empowered to appoint a similar panel.

4. Such panels should within thirty days hear both sides, through their own witnesses, and make public the facts, without recommendation. Upon the appointment of such a panel and for a period of not less than ten days following publication of the facts as found by it, the parties should be obligated to maintain the status quo, unless a settlement is arrived at in the meantime.

Under this program, both parties are subject to the same rules and stand equal before the law. It has little chance of affecting present labor controversies, but is aimed primarily at preventing similar strife in the future.

Some Results of the OPA Dictatorship of Business

When OPA decisions give evidence of being based on common sense and a reasonably clear understanding of business and production problems, there is little criticism of OPA operation, because it is generally conceded that, even if dictatorial, the activities of the OPA, when properly handled, have been useful in restraining a large group of retailers in the pricing of such necessities as food and wearing apparel. But the decisions of the OPA are not always based on common sense and business judgment; quite often the opposite is the case. This is not an undocumented statement, but one borne out by numerous examples.

In a telegram sent by Henry Ford II to the chairman of the House Banking and Currency Committee—Brent Spence—the following details were furnished:

"A foundry that has supplied us for many years with gray iron castings told us they lost $330,000 during 1945 because the cost to them of producing the castings we needed was above the price at which they were allowed to sell to us. They stopped the supply.

"Another supplier had been making thousands of small but vital truck parts for us at 50 cents each. His material prices had gone up so much after V-J Day that he asked OPA for permission to charge 61 cents. OPA said 'No.' They were willing to go as high as 54 cents; but the supplier could not produce parts at that figure, and so he stopped manufacture. After considerable delay, we finally found two new suppliers. One is now furnishing us with the necessary parts at 82 cents, and one at 84 cents each, both with OPA approval."

Another example is furnished by Benjamin H. Namm, president of the National Retail Dry Goods Association. He mentions that one of the leading makers of cotton work socks was refused a modest price increase by the OPA to cover his rising costs. He put 80 per cent of his machinery in grease, and on the remaining 20 per cent made woolen socks, because these he was permitted to sell at a satisfactory price. As a result, his profit on 20 per cent operation—and 20 per cent employment—was greater than that on full production of his standard line."

Obviously instances of this kind cause business and industry to lose faith in the judgment and ability of the OPA to guide this nation's production and distribution in its present difficulties; and while it is admitted that some price controls on certain foods and clothing necessities are desirable, it is questionable whether the nation would not be much better off if all OPA controls were removed. It is quite likely that the stifling of production and employment due to the lack of judgment on the part of OPA officials is more serious to the national welfare than some of the unwarranted advances in retail prices that might ensue if the price controls were removed.

How to Buy Surplus Machine Tools

Suggestions as to How to Proceed in Buying Government-Owned Surplus Machine Tools, Prepared by the National Machine Tool Builders' Association, Cleveland, Ohio, and Arranged in Convenient Question and Answer Form

How Do I Find out what Machine Tools the Government Has for Sale?

(a) Go to the nearest office of the War Assets Corporation (WAC), the newly created subsidiary of the Reconstruction Finance Corporation, now in charge of selling Government-owned machine tools. This office will have a list and description of the machine tools for sale in its district. Arrangements are now being made so that each office will receive regularly, by teletype, lists of the machines for sale in all of the other WAC districts throughout the country. If a machine of the type you want is not on hand in your local WAC district, but is available in some other district, a teletype message may be sent to earmark the machine on your behalf, until further investigation shows whether or not you want to buy it.

(b) You may be able to find out through a visit to a plant still holding Government-owned machines, or from a telephone call to an executive of that plant, what Government-owned machine tools there are in that plant that might be of interest to you, and which may later be made available for sale. However, you cannot negotiate for a machine until it has formally been declared surplus and offered for sale by WAC, which may require some time.

(c) Ask the firm that builds the machine you want, or the dealer who normally sells that machine, to help you find one in the surplus.

For anyone who has had no previous experience in buying Government-owned machine tools, it is suggested that the most practical first step is to make a list of what you want and then visit the nearest WAC office, where questions may be asked and procedures explained.

Where are Government-Owned Machine Tools Located?

Some of these machines are still in contractors' plants. Many are in WAC warehouses. Your nearest WAC office will tell you where you can find and examine the type of machine you are interested in.

How Do I Know Exactly what Sort of Machine I am Buying?

The answer is: "Go and look at the machine."

All surplus machines carry official tags giving the WAC description of the machine. However, owing to the vast size and complexity of the disposal problem, the description on the tag or in the WAC files may not always be accurate or complete. If the machine is not tagged, consult the salesman. Do not rely wholly on this description on the tag—check the machine to be sure it is what you want.

The following methods are suggested for checking as to the exact nature of the machine:

(a) The tag on the machine shows the last user. You may know him. Get in touch with him and see what he can tell you about the machine.

(b) When you want to buy a certain machine from the surplus, ask the builder of the machine, or the machine tool dealer who is the seller of that machine in your neighborhood, to find it for you. This will not increase the price you pay. Commissions are paid by the Government. Do not ask several dealers to find the machine. If dealers learn that the inquiry is broadcast, they will give their time and attention to those that are not.

(c) Telephone or telegraph the original builder of the machine, giving him the serial number and asking him to send you the complete specifications of the machine. This will give you all of the technical details concerning the machine as sold to the first purchaser. The preparation of this data involves considerable clerical work, and some machine tool builders make a nominal charge for this service. However, you will often avoid disappointment and expense by taking this precaution. Many machines built during the war were modified to suit a special need. They may seem entirely standard general-purpose machines on casual inspection, yet be unsuitable for your purpose. The cost of changing an off-standard machine to standard is often prohibitive. Be sure also to check the machine itself—changes may have been made of which the original builder knows nothing.

How Can I Tell in what Condition the Machine is at the Present Time?

Here, again, the answer is: "Go and look at it."

It must be remembered that it is impossible actually to test the operation of a machine that is packed for storage in a warehouse. When Government-owned machine tools are declared surplus, they are inspected by the WAC before being put in a warehouse and classified as new (N) or used (U) and in five classes of condition—excellent, good, fair, poor, and scrap. They are so described in the WAC listing, and also upon the WAC tag attached to the machine. However, this is a superficial rating and carries no warranty with it.

A final inspection of the machine is made by the WAC (unless waived by the buyer) at the time of purchase to check on presence of standard equipment. It does not, however, give you any *warranty* as to condition or quality. Many buyers waive final inspection to expedite delivery.

How are Government-Owned Surplus Machine Tools Priced?

Standard general-purpose machines are priced in accordance with the Clayton Formula. An explanation of this formula and a table showing how surplus machine tool prices are determined by it were published in February, 1946, MACHINERY, pages 174 and 175. For special machines, sales are by negotiation between the buyer and the WAC.

In the case of a standard machine with special tools and attachments, the price of the machine itself is determined under the Clayton Formula and covers the machine itself with standard equipment. The price of special tools and attachments is set by negotiation between the buyer and the WAC. The WAC may, if it chooses, sell the machines minus the special tools and attachments.

On what Basis Do I Pay for a Government-Owned Surplus Machine Tool?

The terms may be cash with order; or 15 per cent with order, and balance over five years in sixty monthly payment. Four per cent interest per annum is charged on the deferred payments.

The buyer does not need to make out an application to purchase. The WAC salesman makes out a sales memo at the time he accepts the 15 per cent, down payment.

When purchasing a machine through a dealer, the procedure remains the same. The final buyer makes the initial and all subsequent payments to WAC. The dealer, whose commission is 12 1/2 per cent, receives quarterly from the WAC all commissions due him, which are paid by the Government and not added to the price to you. Your order is made out on the WAC order form and is an order on the WAC.

What is Meant by "Freezing"?

When a buyer tells the WAC he wants a certain machine, that machine is immediately "frozen" on behalf of that buyer for a reasonable period, until records can be rechecked and papers processed. During this period, the WAC first makes sure that no other buyer has likewise put in an order for the machine; that it is actually available for immediate sale; and that records concerning the machine are complete. However, a buyer naturally cannot keep a machine frozen indefinitely. The usual procedure is to keep it frozen not over a week, although the WAC will make allowance for special circumstances. Furthermore, a dealer wishing to have a machine frozen on his account must present to the WAC a special form that has been signed by the prospective customer, indicating that the customer is considering the purchase of the particular machine in question.

What is Meant by "Plant Clearance"?

In certain cases, in order to clear a contractor's plant for quick reconversion to peacetime production, the WAC may remove Government-owned machine tools from a manufacturing plant to a WAC warehouse immediately, without waiting for WAC inspection or processing required for these machines actually to be declared surplus.

The result is that in some cases there will be machine tools in WAC warehouses which have not yet been officially declared surplus, and which may not appear on the official WAC list of available machines. If a buyer sees and wants one of these machines, he should ask the WAC representative at the warehouse to talk to the local WAC office, and arrange to have the machine declared surplus and available for sale.

To what Extent is the WAC Responsible for the Delivery of a Government-Owned Machine Tool in the Same Condition as when Purchased?

The WAC puts the machine on skids and prepares it for shipment at warehouse or plant. The WAC men at the warehouse will be glad to help you load. *Their responsibility ceases at the shipping point.* The buyer arranges for transportation. The WAC is not responsible for any damage during transportation.

However, the WAC takes cognizance of, and will adjust, any difficulties due to misrepresentation in the specifications of the machine as it was at the time of purchase. For instance, if parts represented as belonging to the machine are missing, or if a part of the machine as delivered proves to be different from that represented, and, therefore, not usable by the buyer, the WAC will make a commensurate adjustment.

What about the Preferences or Priorities Mentioned in the Surplus Disposal Act?

Under official WAC regulations, based upon the Surplus Disposal Act, surplus machines are supposed to be offered to purchasers on the basis of the following priorities:

(a) Federal Government and agencies and instrumentalities thereof. (b) State, county, and municipal governments, and other political subdivisions. (c) Veterans and small business. (A "small business" is an organization which, together with all affiliates in which it has a controlling interest, employs less than 500 employes; or one that is small relative to the other units in its industry.) (d) Large business—small lots for their own use. (e) Large business—large lots for their own use. (f) Dealers when buying for their own account. Dealers placing an order for a customer enjoy the priority standing of that customer.

These priorities are imposed by the law, but in actual practice they are not as restrictive as they may seem. Federal departments have practically without exception retained what they need before declaring the remainder surplus. Local governments need comparatively few machines. When all of the government surplus reaches the market, there will be enough machine tools for everybody.

WAC practice today, therefore, is to do its best to help a manufacturer to get any kind of surplus machine tool he wants at the earliest possible moment. There may be a shortage of certain types of machines at the time you want to buy them. Remember that most of the surplus has not yet been declared.

How Does a School or College Not Organized for Profit Obtain Surplus Machines?

Your order must, after February 16, clear through the Bureau of Education, Federal Security Administration, 26th and Riverside St., N.W., Washington, D. C. You are entitled to a 40 per cent discount beyond the price to other classes of buyers under the Clayton Formula. Before ordering, however, consult the nearest Army Service Command, who may *give*, free of charge, available "excess" machinery and tools to non-profit organizations under ASF Circular 403.

How Long Does it Take to Get a Surplus Machine Delivered?

There is no simple answer to this question. Being a Government agency, the WAC must of necessity operate within a framework of rules, regulations, and procedures. Short cuts, such as are used in private business, are impossible. A reasonable degree of patience is therefore imperative in purchasing Government-owned machine tools.

It must be remembered that the over-all job of disposal of all types of Government-owned surpluses is one of incredible size and complexity. Machine tools represent only one small part of this over-all task. The bulk of the surplus is not yet in WAC hands. Get an accredited dealer to keep watch for what you want.

The personnel of the WAC engaged in machine tool disposal are earnestly endeavoring to facilitate action and cooperate with buyers to the fullest possible extent.

* * *

Gear Industry Reports Increase

According to a report of the American Gear Manufacturers Association, the gearing industry, as represented by members of the Association, showed an increase in volume of sales for January, 1946 (the last month for which figures are available), of 12.6 per cent, compared with December, 1945. These figures do not include turbine or propulsion gearing.

The Fiftieth Anniversary of the Erie Foundry Co.

The Erie Foundry Co., Erie, Pa., has just celebrated the completion of fifty years in business. It was in September, 1895, that Fred F. Clark and John R. McDonald, two young men in their twenties, who worked together at the First National Bank of Erie, conceived the idea of starting a foundry business. Each of them was able to put $2000 into the enterprise; but they concluded that it was not possible to start a foundry business with a capital of less than $10,000. They succeeded, however, in obtaining the remainder of the required capital from Charles M. Reed, a prominent citizen and financier in Erie; Henry C. Kelsey; and George A. Gaither, the latter foreman of the old Chicago & Erie Stove Works, where he had learned the molding trade, and who became the first superintendent of the new foundry at the considerable salary of $88 a month.

Charles M. Reed became the first president, and Fred Clark was elected vice-president, a position he has continued to fill without interruption during the company's entire first half century. John R. McDonald began as secretary and treasurer. He remained treasurer until his death in 1937, served as president from 1915 to 1935, and as chairman of the board from 1935 until 1937. Henry Kelsey continued as a director of the company until his death in 1918.

In the years that have passed since the founding of this business, the Erie Foundry Co. has contributed largely to the progress of industrial enterprises in this country and abroad through the products that it has made. Today it is well known as a maker of forging hammers, some of which weigh upward of 1,250,000 pounds.

The $10,000 that the five founders invested between them in 1895 have created in this first half century of the company's activities, $60,000,000 worth of goods and services to add to the useful and productive resources of industry.

To commemorate the fiftieth anniversary, the company has published an unusually interesting historical review of its foundation and growth, entitled "Hammerscale 1895-1945."

* * *

Commercial Standards for Sine Bars, Blocks, Plates, and Fixtures

The National Bureau of Standards, Washington, D. C., has prepared a draft for a commercial standard for sine bars, blocks, plates, and fixtures, known as TS-4066, which is being circulated to the industry for acceptance. Because of the almost universal application of equipment and accessories of this kind in the machine shop field, many firms and individuals will be interested in this proposed commercial standard. They can obtain a copy for study by addressing the Division of Trade Standards, Bureau of Standards, Washington 25, D. C.

Carbide Milling Cutter Data Calculating Chart

Compiled by
THE COOPER-BESSEMER CORPORATION
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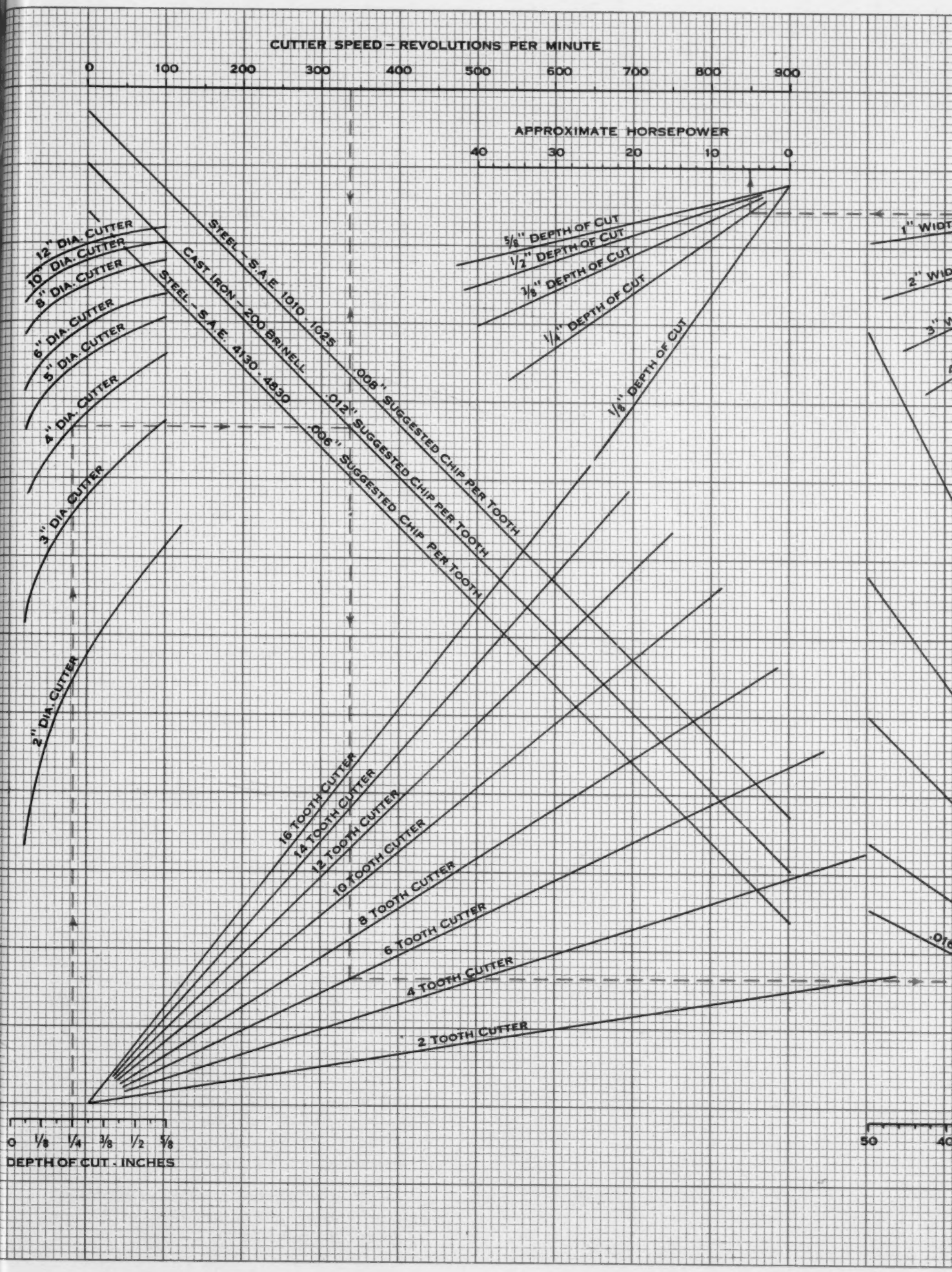
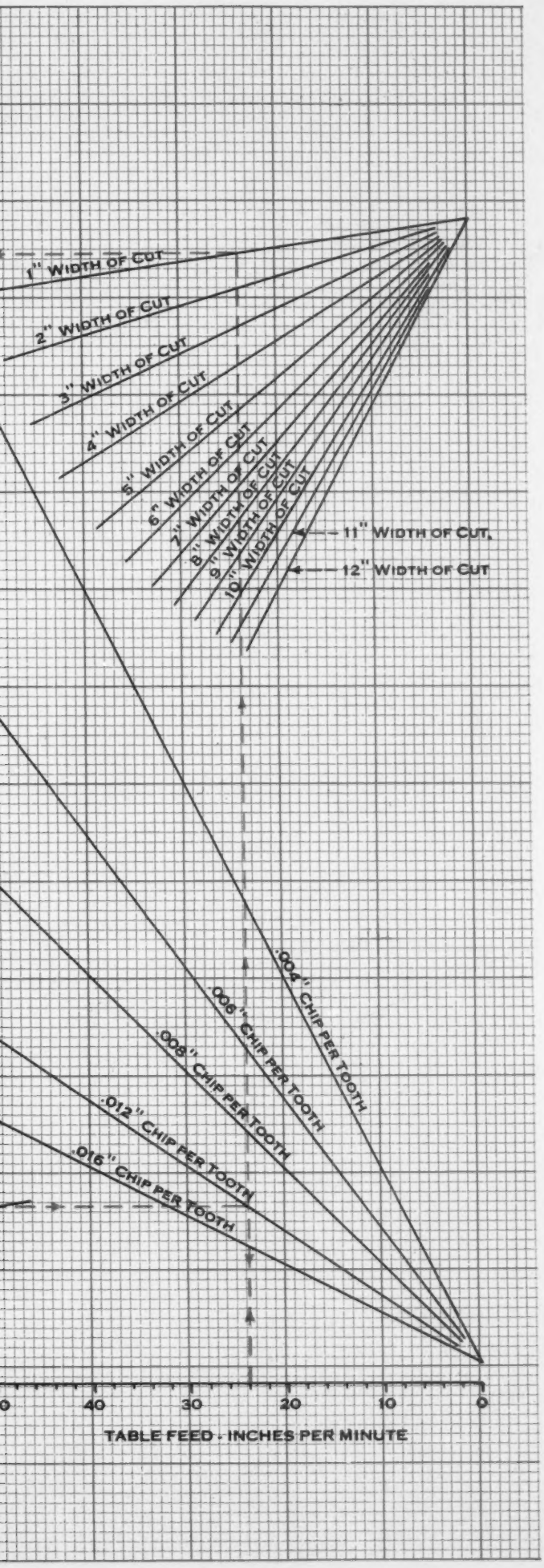
MACHINERY, April, 1946


CUTTER SPEED – REVOLUTIONS PER MINUTE
0
100
200
300
400
500
600
700
800
900
APPROXIMATE HORSEPOWER
40
30
20
10
0
12" DIA. CUTTER
10" DIA. CUTTER
8" DIA. CUTTER
6" DIA. CUTTER
5" DIA. CUTTER
4" DIA. CUTTER
3" DIA. CUTTER
2" DIA. CUTTER
STEEL - S.A.E. 1010 - 1025
CAST IRON - 200 BRINELL
STEEL - S.A.E. 4130 - 4830
.008" SUGGESTED CHIP PER TOOTH
.012" SUGGESTED CHIP PER TOOTH
.006" SUGGESTED CHIP PER TOOTH
5/8" DEPTH OF CUT
1/2" DEPTH OF CUT
3/8" DEPTH OF CUT
1/4" DEPTH OF CUT
1/8" DEPTH OF CUT
16 TOOTH CUTTER
14 TOOTH CUTTER
12 TOOTH CUTTER
10 TOOTH CUTTER
8 TOOTH CUTTER
6 TOOTH CUTTER
4 TOOTH CUTTER
2 TOOTH CUTTER
1" WIDT
2" WID
3" W
.01
0
1/8
1/4
3/8
1/2
5/8
DEPTH OF CUT - INCHES
50
40



Carbide Milling Cutter Data Calculating Chart

INSTRUCTIONS FOR USE OF CHART

(Follow Dash Lines)

TO FIND CUTTER SPEED

1. Select desired Depth of Cut on scale in lower left-hand corner.
2. Follow vertical line up to desired Cutter Diameter.
3. Then follow horizontal line to right to the line indicating Material Being Cut.
4. Then follow vertical line up to find suggested Cutter Speed.

TO FIND TABLE FEED

1. From suggested Cutter Speed follow vertical line down to Number of Teeth in Cutter.
2. Then follow horizontal line to right to suggested Chip Thickness per Tooth. (See Material line for suggested Chip Thickness per Tooth.)
3. Follow vertical line down to obtain Table Feed.

TO FIND APPROXIMATE HORSEPOWER

1. From Table Feed follow vertical line up to Width of Cut.
2. Then follow horizontal line to left to Depth of Cut.
3. From this point follow vertical line up to determine the approximate Horsepower required to drive the cutter.

The red dotted lines show an example of the method of using the chart. In this case, the cutter speed, table feed, and approximate horsepower are to be determined when using a six-tooth carbide milling cutter, 4 inches in diameter, with a depth of cut of 1/4 inch and a width of cut of 1 inch, operating on cast iron of 200 Brinell hardness. It will be seen that the cutter speed suggested is about 340 R.P.M., the table feed is 24 inches per minute, and approximately 5 H.P. is required to drive the cutter.

The chart also may be applied to Single-Point Tools by determining data for "2-Tooth Cutter" and dividing by 2.

Induction Brazing of Carbide Tips to Tools

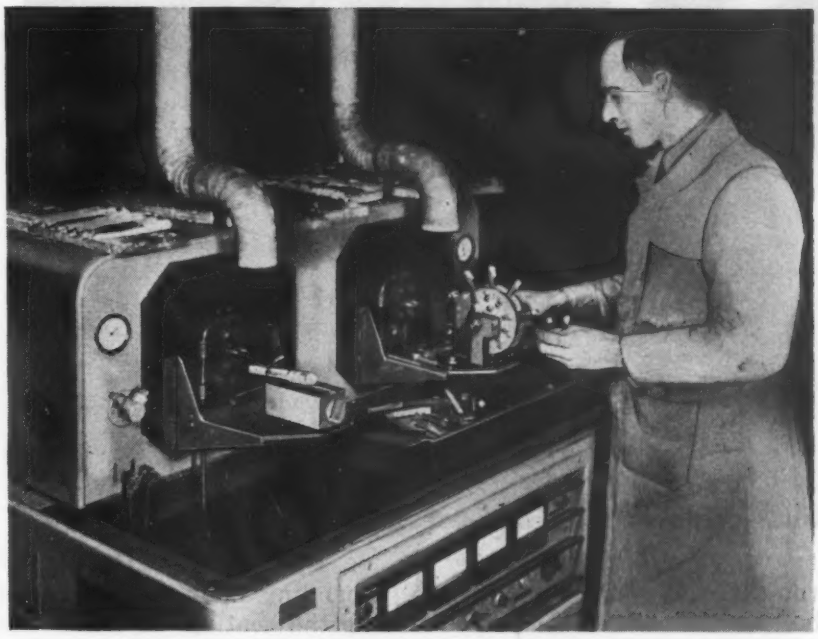


Fig. 1. Operator is Shown Inserting Tool in Rotary Fixture Preparatory to Brazing, and Revolving Fixture by Hand to Bring Each Tool into the Field of the Induction Coil

INDUCTION heating is being used for brazing tungsten-carbide tips to more than two hundred types of cutting tools by the Willey's Carbide Tool Co., Detroit, Mich. Greatly increased output, with no increase in manpower, and reduced costs are claimed for this method. Two 15-kilowatt, two-station, 9600-cycle, Tocco induction heating units with water-cooled, interchangeable coils to accommodate different tools are used in this shop.

A rotary fixture for holding the work, shown at the right-hand station of the induction unit in Figs. 1 and 2, is a major factor in the increased production obtained. This fixture enables each operator to perform work eight times as fast as with previous methods. The fixture consists of a Transite block, 6 inches in diameter by 1 1/2 inches wide, mounted on a spindle attached to an upright support. It has a capacity for about twenty tools ranging in size from 1/4 to 3/4 inch square and of moderate length. The Transite block is held on the fixture by only three bolts, thus allowing quick removal when required to accommodate different sizes of tools. The tools are held in the fixture by spring tension. The adhesive quality of the brazing flux holds the tip in position during the feeding of the tool. The operator rotates the fixture by hand, bringing each tool into the field of the inductor coil, where it becomes heated. After completion of the brazing, each tool is turned to a vertical position and released automatically from the fixture, dropping into a tote-box or onto a conveyor below.

A screw clamp fixture, as shown in the foreground of Fig. 3, or a magnetic chuck may also be employed to hold tools beneath the inductor while brazing. Two sizes of magnetic chucks, 3 inches square by 6 inches long and 4 inches square by 6 inches long, are used in this shop. With magnetic chucks, large tools, such as the drill shown at the left-hand station of the induction heating unit in Fig. 2, can be quickly and easily positioned beneath the inductor and held firmly during the brazing cycle.

The technique of brazing carbide tips properly to the numerous styles of tools encountered is not complicated. With the carbide tip and brazing material positioned in the recess in the tool, the operator places the tool beneath the inductor. The heating cycle may run

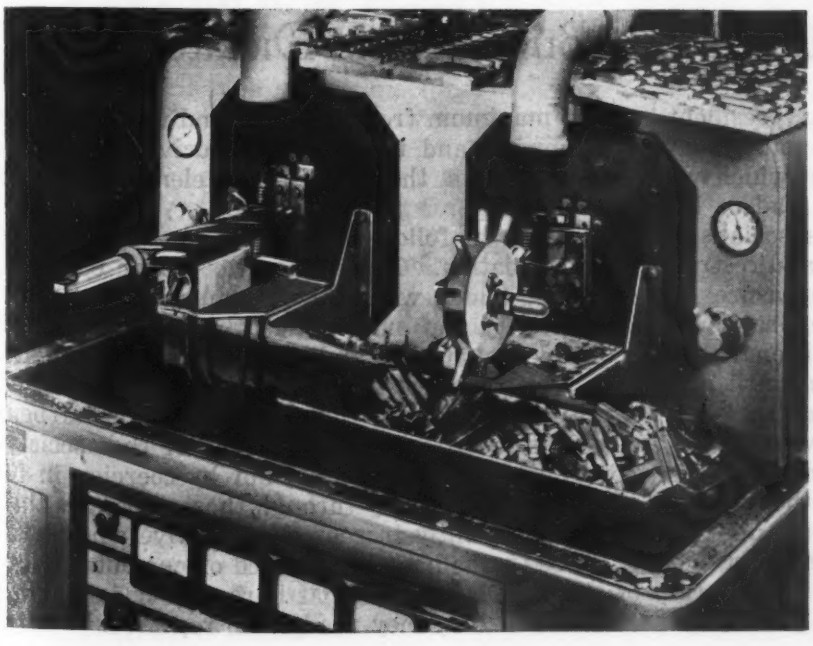


Fig. 2. Two Brazing Operations can be Performed Simultaneously on This Two-station Tocco Induction Heating Unit. A Large-diameter Drill, Held on a Magnetic Chuck, is being Brazed at the Left

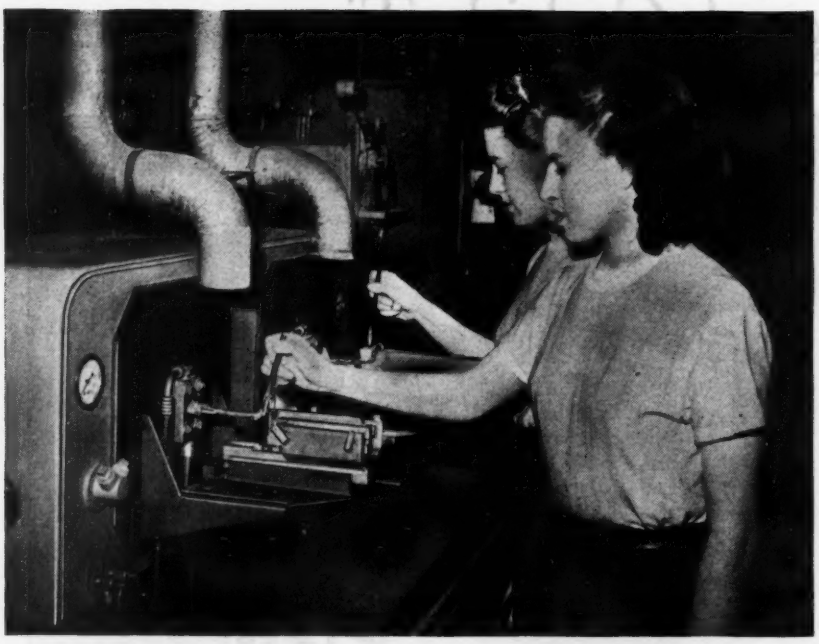


Fig. 3. A Screw Clamp Fixture for Holding Tools while Brazing is Shown in the Foreground. The Operator at the Rear Station is "Wiping" a Tip into Place on a 1 1/4- by 1 1/2-inch Straight-shank Shell-turning Tool

from three seconds to a minute, depending upon the type of tool being brazed. During the heating cycle, the operator uses a small rod to "wipe" the tip into place as the brazing material softens. The heating cycle can be controlled automatically or manually. With induction heating, the heat can be concentrated on the tip end of the tool; thus, the remainder of the shank is usually cool enough to permit the operator to handle the brazed tool with a gloved hand. Only small tools require tongs for handling them. A brazed tip can be quickly removed from a shank by using induction heating to remelt the brazing material.

The following production has been obtained on one of the 15-kilowatt Tocco machines: 400 carbide tips per hour brazed on 1/4-inch square tool bits; 325 tips per hour on 1/2-inch square tool bits; and 250 per hour on 3/4-inch square tool bits. Two operators using one two-station induction heating unit have brazed 85 carbide tips per hour to 1 1/4- by 1 1/2-inch straight-shank, shell-turning tools. The best production obtained with previous methods was 80 of these tools per eight-hour day. One operator has brazed from 150 to 200 one-half-inch diamond dressing tools per hour.

Brazing of two-tipped tools without the wiring required to secure the tips to the tools by other methods has been achieved with the induction process. Drills, reamers, and counterbores can also be brazed without wiring the tips. Line reamers with a 20-degree spiral have had insert tips 5 inches long brazed by induction heating. Broach buttons from 1/4 to 1 inch in diameter have also been brazed by this method.

Government Controls Lead to Bureaucratic Dictatorship

IN a recent address, Louis Ruthenburg, president and general manager of Servel, Inc., pointed out that the road we now follow, and upon which we first set our feet many years ago, will lead us inevitably, step by step, through various socialistic measures to the supremacy of the state and restriction of individual liberty. "Every measure of economic control exercised by the state," said Mr. Ruthenburg, "induces the need for additional controls, which increase in geometric ratio until dictatorship and absolutism become inevitable.

"The other road along which we traveled to attain the highest material living standard ever achieved by any nation at any time in the world's history is not a mysterious road, nor one difficult to rediscover. It is well defined by the precepts which were developed by the founders of this republic. Its course is marked by guide posts indicating maximum freedom of the individual, and an environment and incentives conducive to effective cooperation on the part of all elements of our society.

"Those who follow that road abhor coercion and class legislation. They adhere to proven economic concepts, under which they comprehend that an ideal society can only be sustained upon a sound economic foundation, and that constructive government can only be the by-product of a stabilized society; and, finally, that balanced material benefits can be brought to all classes of that society, not by legislative meddling, nor by coercion in its many guises, but only through those processes that lead to constantly increased productive efficiency."

These truths have been stated often; but in view of the serious inroads that bureaucracy is making on our liberties, they need to be repeated.

Boring Machine Tool Castings for Anti-Friction Bearings

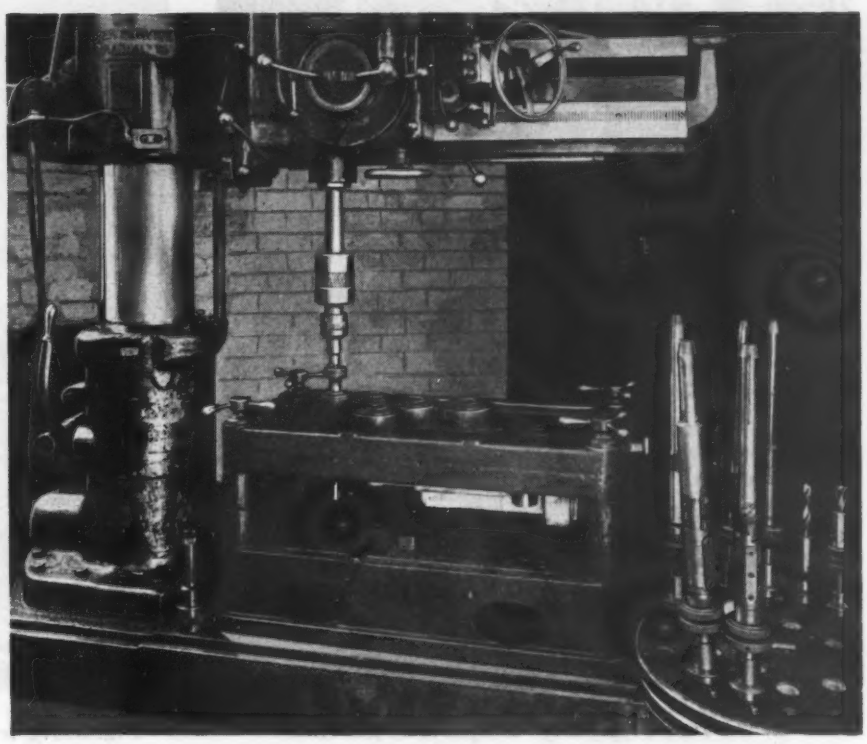


Fig. 1. Tooling Designed for Performing Precision Boring Operations on a Radial Drilling Machine

PRECISION boring of castings to seat anti-friction bearings is one of the major problems in the manufacture of machine tools. Certain bearing applications in machine tools do not come within the regular bearing fit classifications. The bore sizes for such special applications are a result of operational experience, tests, and engineering computations. The tolerances for such bores are usually closer than those generally applied to anti-friction bearing practice.

The material from which the casting is made and the manner in which the hole is to be produced are other variables that must be considered in specifying the dimensions of the bearing housing. Sound practice in the production of precision holes necessitates the three following operations: First, removal of metal by coring or core drilling; second, alignment or straightening of the hole, usually by boring; and third, sizing of the hole by boring or reaming. It is the job of the tool engineer to supply tooling capable of obtaining these determined dimensions, which are requisites of quality control.

Prior to World War II, the demands for precision boring at the Axelson Mfg. Co., Los Angeles, Calif., were successfully met by the use of several standard universal type boring machines and one large master boring mill designed by Axelson. As increased production during the war seriously burdened the capacity of these boring mills, the overflow was handled on a radial drilling machine in the manner described in this article.

A coupling was designed to be mounted in the spindle of the radial drilling machine, as shown in Fig. 1. This coupling is free to float both axially and angularly, thus preventing errors due to spindle misalignment from being transferred to the work. A positive drive feature prevents intermittent rotation, with resultant interrupted feed.

The first jig designed for boring on the radial drill was of the box type, with a removable top, as illustrated in Fig. 2. This jig accommodated both the inside and outside halves of a cast-iron Axelson lathe apron. First the inside apron plate was clamped to the top of the jig and bored, after which it was removed and the outside plate was clamped to the bottom of the jig and bored. The boring-bars were guided at both the top and bottom of the jig by quills mounted in anti-friction bearings. A fixed key on the boring-bars rotated the top quill, and the bottom quill was rotated by a spring-operated pin on the quill, which engaged one of three slots in the boring-bar. The only difficulties encountered in the use of this jig were the unwieldy method of handling the work and the inadequate means of chip disposal.

An improved jig developed for this work is shown in Fig. 3. Both front and rear lathe apron plates are handled in this jig also, but in this case, one plate is clamped to each side of the center member of the jig. The apron plates are machined one at a time. After machining the precision bores and counterbores in one side of one apron plate, the jig is rotated 180 degrees by means of a speed wrench, which obtains power from the radial drilling machine, for boring and counterboring the other side of the same plate. This operation is then repeated on the other apron plate.

The boring-bar is always guided by two bearings (except when counterboring), one in the center member of the jig and the other in either of the two outer members. Centrifugally cast aluminum-bronze alloy bearings (Grade 18 Ampco metal) were substituted for the anti-friction bearings used for supporting the quills in the previous

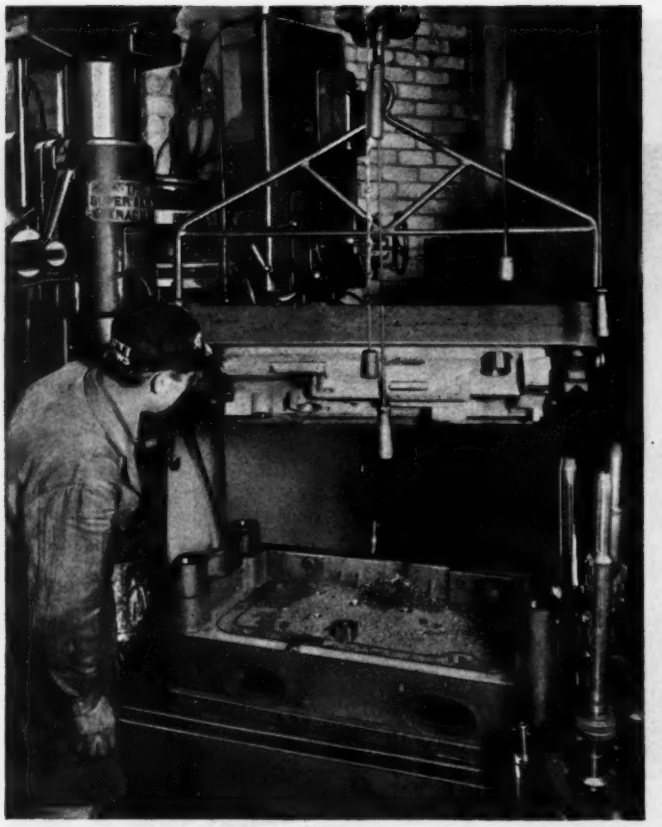


Fig. 2. Jig Originally Employed for Boring Lathe Aprons on a Drilling Machine

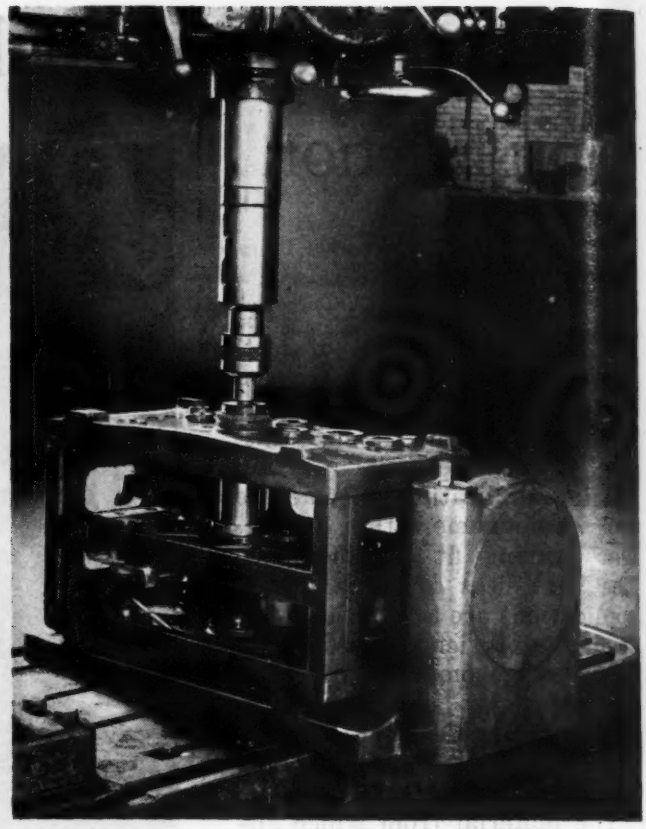


Fig. 3. Jig which Rotates 180 Degrees for Boring and Counterboring Both Sides of Lathe Apron

jig. The non-seizing characteristics and good wear resistance of this metal made it ideal for this bearing application.

The problem of chip disposal is also eliminated in this improved design of jig.

Some of the boring-bars with interchangeable carbide tips used in this operation are shown in Fig. 4. These tools, manufactured by the Eclipse Counterbore Co., Detroit, Mich., permit the same bar to be used for roughing and finishing several bores within an appreciable range of diameters. Although non-adjustable, these tools have the advantages of being "tamper-proof" and the tips can be quickly changed. The carbide tips have generally been found to be capable of producing a minimum of 100 holes when used for finishing operations. The tip is then reground to the dimensions of a roughing cutter for the original nominal bore size. In this capacity, it produces approximately 200 holes because of the broader tolerances allowed in roughing. The tip is then reground to use as a finishing tool for a smaller bore.

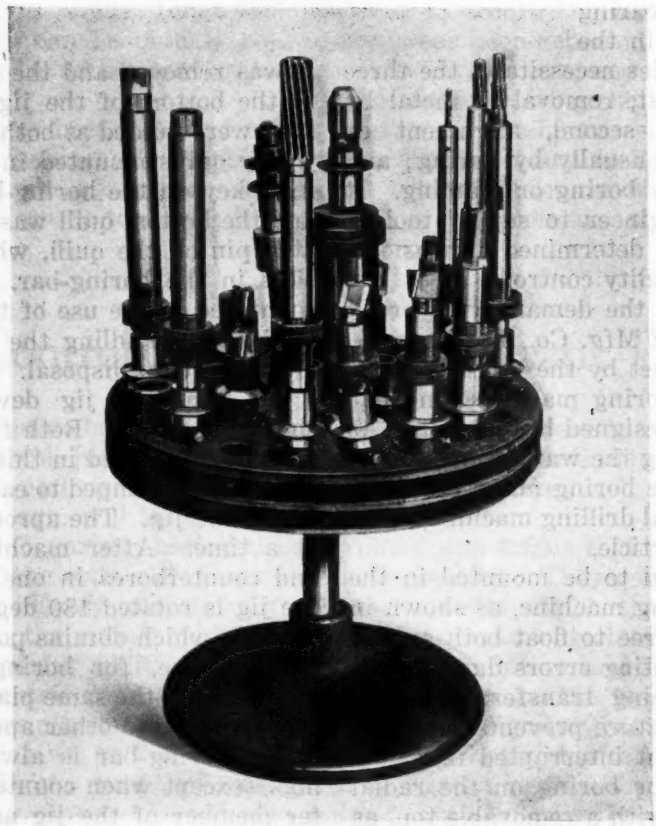


Fig. 4. Boring-bars with Interchangeable Carbide Tips Used in the Precision Boring of Lathe Aprons

This method of producing precision bearing bores on a radial drilling machine is not recommended as a substitute for work that can be handled in regular boring machines. Practices differing from those outlined must be developed for each shop. In using this method, skill and care are required of the machine operator.

Typical Examples of Contour Forming

By CYRIL J. BATH
The Cyril Bath Co., Cleveland, Ohio

CONTOUR forming refers to the process of forming metal sections into varied shapes. Basically, this is a very old art. In the past, the majority of this work was done on power presses and bulldozers. Recently, however, contour forming has been developed to form shapes not feasible to handle by single- or multiple-press action.

One of the pre-war applications of this process was the forming of domestic refrigerator outer cases. The curved crown and the corners and sides were formed out of one sheet of metal that had previously been formed by rolls or presses into the desired cross-section, with flanges turned up front and back. The problem involved in this case was how to form the crown both from front to back and from right to left without causing wrinkles either in the channels on the front and back or in the top, or waves in the side panels due to metal movement. A quite considerable movement of metal actually takes place. For instance, in a certain refrigerator shell the flange members are compressed at their inner edges in a 90-degree movement some 3/4 inch in length, while at the same time, the outer case at the center line is stretched 3/4 inch.

This typical operation involves a close control of the material during the process of forming. Any wrinkles or deformation, even some not apparent to the eye, show up when the part is painted, and completely spoil the job. It is of first importance in this work to produce duplicate parts and almost equally important that the parts be free from work marks.

Early machines made for this work were called "tangent benders," and modifications of these are well adapted to making

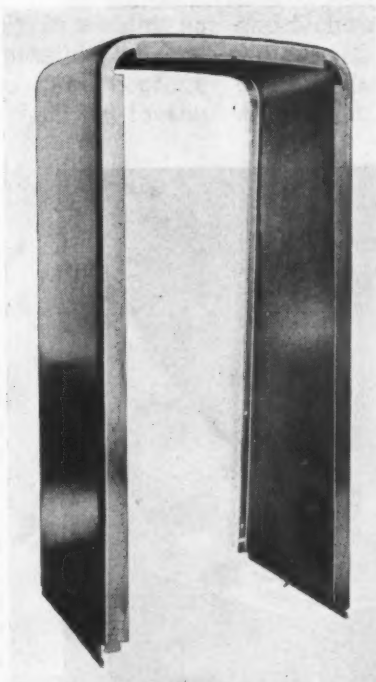
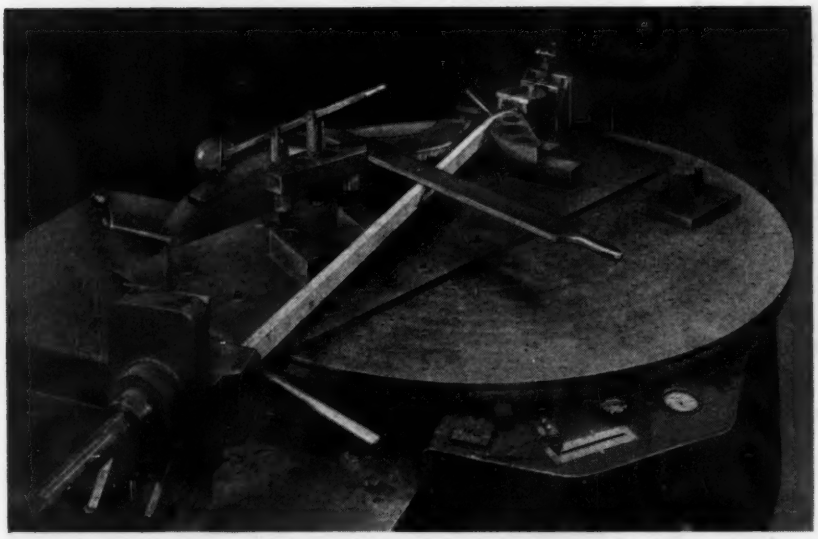
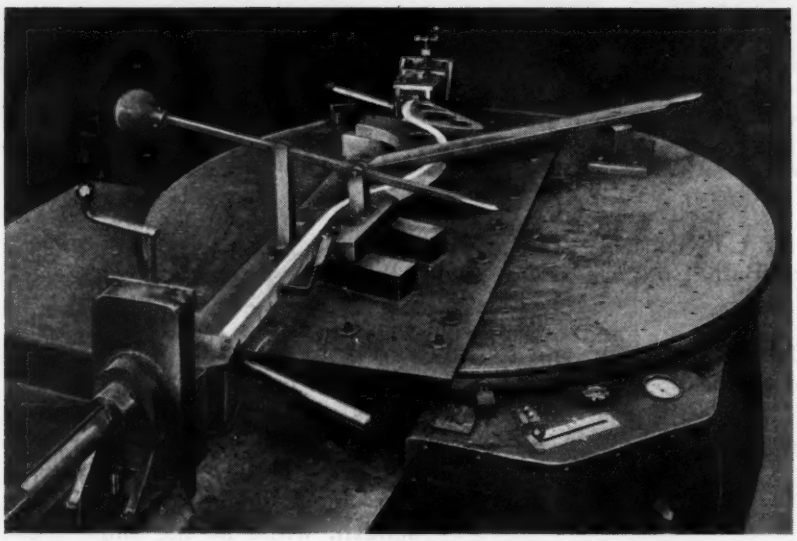
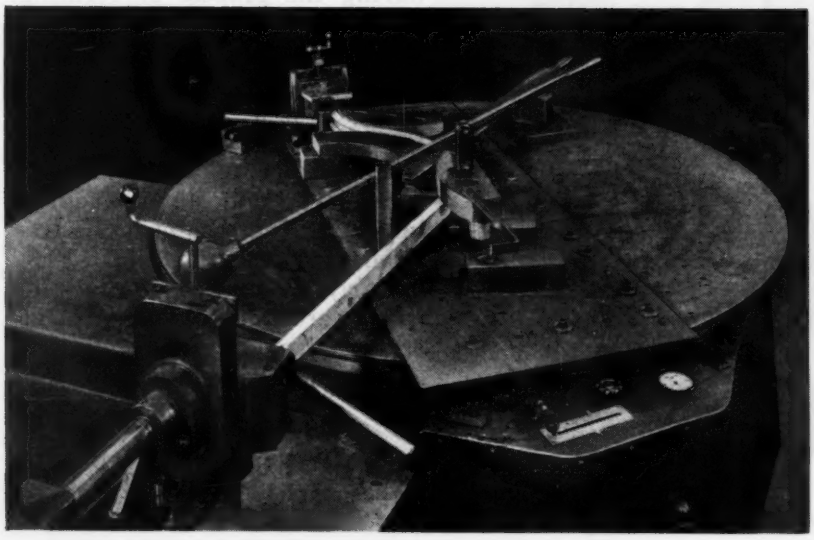


Fig. 1. (Above) The Universal Contour Former Developed for War Work Finds Many Peacetime Applications

Fig. 2. (Left) Shell for a Domestic Refrigerator Case—an Example of Contour Formed Work







washing machine or deep-freeze unit cabinets in one piece and rectangular shapes of all kinds. A round form in mild steel is, however, more simply rolled.

With the outbreak of the war, new problems were tackled, principally in the airplane field. The aluminum extrusion process presented the aircraft designer with an economical means of securing almost any kind of cross-section; the parts thus produced were formed into the shapes that the progress of the art required. Making these complex sections follow compound curves, often in different planes, was not an easy job. To aid in this work, many machines were devised, including the universal contour former. This machine not alone forms a constant sectional member into accurate curved shapes, but changes the cross-sections during the bending process.

For instance, the members by which the wing tips of an airplane are bolted to the center section in many constructions, and the center section attached to the fuselage, may be received in the shop as simple right-angle extrusions; but because of the angle at which the wing is joined to the body, the structural angle must be continuously varied, so that one leg of the angle presents a flat surface for bolting while the other follows the curve and angle of the skin and other parts to which it is attached. Furthermore, such bends must be very accurate, to avoid bolt and rivet strain. Similar conditions prevail throughout the plane—for instance, in door frames, in tank straps, and in a number of other parts.

The differences between this class of work and the refrigerator parts previously referred to are so great that it was necessary to develop altogether different machinery, such as the universal contour former shown in Fig. 1, as previously mentioned. It has been found that aluminum, like stainless steel, can in most cases be formed to the accu-

Fig. 3. (Above) First Operation in Making a Reverse Channel Bend. Fig. 4. (Center) Second Operation in Making the Reverse Channel Bend. Fig. 5. (Below) Third Operation in Making the Channel Bend. For This Operation, the Table Reverses

racy required only by a stretching operation.

What has been learned about contour forming for wartime equipment has proved useful in working out civilian applications, particularly in transport equipment, where the lighter alloys are being widely used today.

Contour forming work may generally be divided into two classes—that which can be done by stretching, and that which can be best compress-formed. The latter process involves wiping, rolling, or forming with tangent bending bars. Some work, such as the forming of long difficult hollow shapes like rectangular tubes, requires a combination of both methods. To meet this condition, a machine has been developed that can be readily adapted to either process. Many forms that run into complete circles, and even spiral members, can be handled by this equipment, although they could not be formed in rolls, either because of their shape or, in the case of stainless steel or aluminum alloys, because of spring-back. This machine was designed to produce ordinary curves or reverse bends, or bends in several planes, as well as circles and spirals. Figs. 3, 4, and 5 show successive steps in making a reverse bend in a channel.

Fig. 6. An Angle Formed in Two Planes by Stretching

With this machine it is possible to produce many parts in one piece which had previously been made in small sections by reason of limitations in the equipment available. Much economy in weight, as well as in labor and material, is possible by further application of this principle. The contour process is not limited to any one field or to the relatively newer metals. It is equally applicable to rub-rails for trailers, as shown in Fig. 1, and to car and bus bumpers made from tough alloy steels.

In developing equipment for this forming work, the cost of dies and set-up must be considered, because much material is formed in small quantities. As a rule, if the lots run to only one hundred pieces or so, it is cheaper to form the parts by hand when possible, because dies are expensive both to design and to build.

In fact, one of the limitations of contour forming is due to the scarcity of men with imagination and technical ability that are capable of taking advantage of the opportunities the process offers. The contour former is essentially a jobbing tool—an all-around tool; if work is to be produced in con-

Fig. 7. Steel Hat Sections Produced by Compression-forming on Contour Machine

siderable quantity, specialized machines may be preferable. Generally speaking, parts that can be produced at the rate of ten or fifteen an hour in the regular contour former can be made at a rate as high as one or two a minute on a specialized machine designed for the purpose.

A Few Guiding Principles in Contour Forming

The following points will prove helpful in solving contour forming problems.

First, we must decide if the part is to be stretch-formed or compression-formed. If it is made from a high-alloy material, it is almost invariably a stretching operation, as this material cannot be formed properly by compression methods. If the piece is SAE 1020 steel, or low-alloy aluminum or stainless steel, it might be compression-formed. This may be desirable because of prior punch-holes which generally preclude stretch-forming.

In general, if the piece has a severe curvature, compression-working may give just as good results as stretching, and the tooling is likely to cost somewhat less. In long shallow bends, however, even in soft materials, stretch-forming gives a uniform product, because the pressure may be varied to offset variations in the material. Heavier members tend to hold their shape better, but taking an average of all classes of work, 40 per cent is handled by compression, 50 per cent by stretching, and 10 per cent is done by both processes, applied either simultaneously or serially.

The specified materials frequently do not have sufficient elongation characteristics to stand the required forming by stretching, and therefore must be compress-formed or compressed and stretched at the same time. In the latter process, the metal at the inner radius of the part is compressed or foreshortened, while, at the same time, the metal at the outer areas is stretched. Typical hat sections, 36 inches long, when formed as shown in Fig. 7, were compressed at the inner surface 5 1/8 inches, while the outer flange was stretched 6 7/8 inches at the same time, the parts being produced without wrinkles or work marks.

If the part to be formed is a hollow section, this involves one or several processes, dependent on the material being worked, the severity of the contour, and the tolerance limits. As in all other work, close tolerances take more time and better tooling, which means higher cost.

If the piece to be made requires contours in two planes, as in Fig. 6, it is necessary to move the pulling head up or down and to clamp the job after the heaviest pressure load has passed a given point of the section. Often this involves stopping and starting a machine several times to complete the work. Obviously, two-plane contours are the most difficult bends to make. Some work has contours in two planes at right angles. In this case, two separate operations are required.

Some work has reverse bends in the same plane. To produce this class of work, first, bend in one direction, and when this bend is completed, drop a section of the die into place and reverse the table. In Figs. 3, 4, and 5, work of this type is shown, four bends being produced in a channel at one pass through the machine.

In conclusion, it may be said that contour forming offers many economies and considerable opportunity for improvement in the appearance of designs. It is not intended to compete with press type operations, when these can be successfully performed, but occupies a field all of its own.

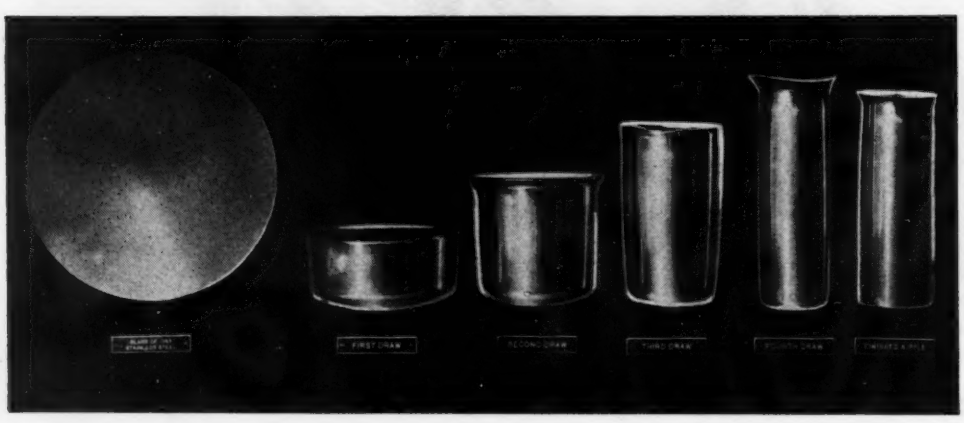
* * *

Die Life Lengthened by the Use of Carboloy

Die life was lengthened from ten to twenty times by the use of Carboloy nibs on three out of the four dies used in forming stainless-steel sleeves at the plant of the Neu-Bart Stamping & Mfg. Co., Los Angeles, Calif.

As shown in the illustration, the first step of the process consisted of forming a cup, 5 1/2 inches in diameter, from a stainless-steel blank 9 inches in diameter and 0.063 inch thick. The next three operations, which were performed with dies having the cemented-carbide nibs, reduced the outside diameter of the sleeve successively to 4, 3, and finally to 2 3/8 inches.

The steel dies used previously produced approximately 500 to 1000 pieces before regrinding was necessary, while the Carboloy equipped dies regularly turned out between 5000 and 10,000 sleeves before they had to be repolished.



Operations in the Forming of an Airplane Exhaust System Sleeve from a Stainless-steel Blank

Portable Machine Shop

A truck-mounted repair shop designed for the use of contractors, utility and oil companies, mines, railroads, street railway systems, highway departments, and concerns having mechanical equipment distributed over extended areas is being built by the Davey Compressor Co., Kent, Ohio. This unit, known as the "Davey Mobile Repair Shop," is suitable for mounting on any standard long wheel-base truck. It contains virtually every item of equipment needed for mechanical repair and maintenance work.

While this mobile shop can be furnished with almost any desired combination of equipment, the manufacturer has worked out a number of standard assemblies for the use of specific operators. For example, one assembly includes as its main units a Davey 60 cubic-foot compressor; a Lincoln 300-ampere welding generator; a Westinghouse 5-kilowatt power generator; a South Bend 14-inch lathe, with complete accessories and tools; and a drill press of 1-inch capacity.

Auxiliary accessories are the same as those found in any stationary machine shop. They include a blacksmith's forge and tools, two sets of fitter's equipment, a set of boilermaker's hand tools, a 1/2-ton hoist, two 10-ton jacks, a hand-operated hoisting winch, plumber's tool kit, carpenter's tool kit, set of wood and steel drills, set of electrician's hand tools, a 30 cubic-foot acetylene generator, gas welding and cutting equipment, oxygen bottles, electric welding accessories, grinder with drill-grinding attachment, pneumatic hand grinder, two pneumatic riveting hammers, two pneumatic hand drills, axe, pick, saw, soldering irons, emergency lights, air hose, shovel, etc.

The key unit of the entire assembly is the Davey split-propeller power take-off, which is inserted in the drive-shaft of the truck to permit utilizing all the power of the truck engine for driving the air compressor, welding generator, and power generator. Its use eliminates the need for separate driving engines for each piece of equipment and permits mounting, on one truck, machines which, if individually driven, would require at least three trucks. This power take-off can easily be installed in any garage or service shop.

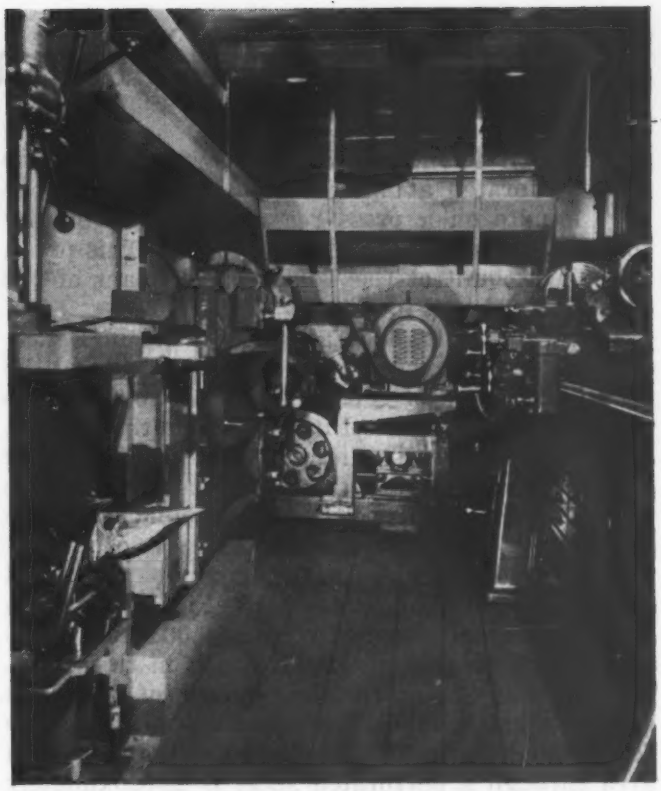


Fig. 2. View Showing How Equipment is Arranged to Provide Adequate Space for Several Workmen

The truck body is replete with tool boxes and storage bins. An outside power receptacle is provided for local electric current when available. There are also seven inside power receptacles and five interior ceiling lights.

The lower third of the sides of the truck body can be lowered to a horizontal position, where they provide a large amount of outside work-bench space. The upper two-thirds of the body sides are raised to furnish protection against sun and rain for the men working outside the truck at the benches. The body is waterproof, and can be locked to prevent tampering or theft.

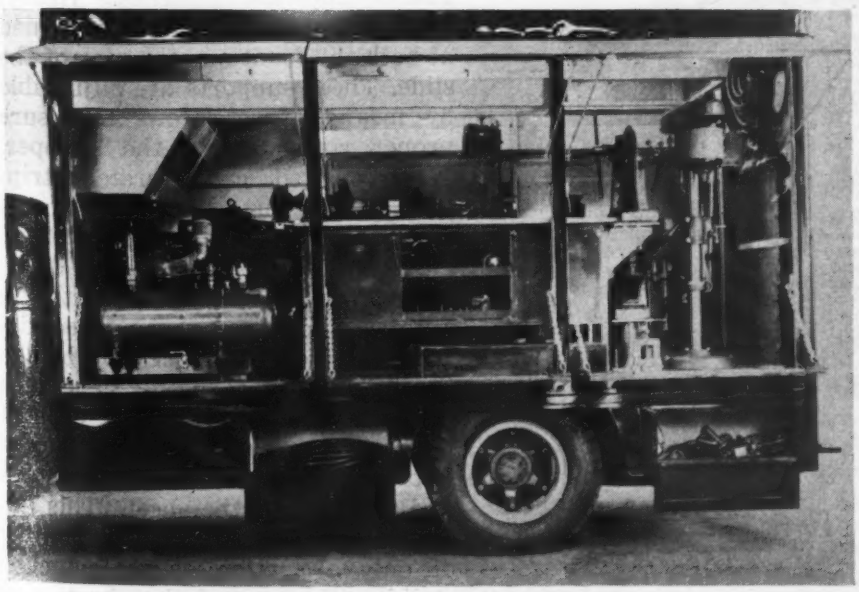


Fig. 1. Portable Truck-mounted Machine Shop Containing All the Equipment Commonly Found in Central Repair Shops

* * *

The idea that wages should be based upon the ability to pay is one of the most amazing economic fallacies ever suggested in America.—*George T. Trundle, Jr.*

High-Speed Perforating of Sheet Metal

SHEETS 40 inches wide by 60 inches long are perforated at speeds up to 360 strokes per minute on a press recently brought out by the E. W. Bliss Co., Brooklyn 32, N. Y. This press, which was built at the Toledo, Ohio, plant of the concern, is shown in Fig. 1.

Perforated slits, such as shown at *A* in Fig. 3, are produced in sheets by using a punch and die set of a construction somewhat similar to that illustrated in Fig. 2. This set includes a multiple punch, a stripper plate, and a die, which are provided with guide pins and bushings to insure accurate alignment of the comparatively fragile punches in the die slits.

Another interesting perforating job performed on the machine is indicated at *B*, Fig. 3. Six hundred and eleven staggered holes of 0.031 inch diameter are perforated per square inch in this sheet. The work at *C* requires the piercing of 3/32-inch diameter holes on 5/32-inch centers. There are forty-four holes per square inch, so that the open area through a perforated sheet is approximately 35 per cent of the total sheet area.

Oblong slots 3/32 inch wide by 3/4 inch long are perforated in a staggered arrangement, with a distance of 3/16 inch between the centers of adjacent slits, on the sheet illustrated at *D*. Twenty-seven perforations are cut in one row across the sheet with each stroke of the press.

The new high-speed perforating press has a capacity of 75 tons. The slide has a stroke of 5/16 inch and a vertical adjustment of 1 inch. The standard machine will take sheets up to 40 inches in width. Strokes from 180 to 360 per minute are obtainable.

In addition to precision dies, this machine requires an unusually accurate feed mechanism. The feed mechanism is of the double-roll type, and is driven by an adjustable feed-crank on the right-hand side of the machine. The feed-rolls are of hardened and ground alloy steel, and are mounted in bronze bearings in such a way that true alignment is insured. The feed is operated through a removable ratchet on the right-hand side of the press, which provides feeds in increments of 1/64 inch per one-tooth indexing of the ratchet. Thus by adjusting the feed-crank to cause an indexing of one, two, or three teeth of the ratchet, a feed of 1/64, 1/32, or 3/64 inch is obtained. The maximum feed per stroke of the machine is 5/8 inch. Special ratchets can be supplied to provide a minimum feed of 0.010 inch.

A new type of releasing mechanism is provided for the upper gripping rolls which releases both rolls simultaneously. Heavy coil springs provide the gripping pressure between the feed-rolls. A straight front-to-back feed is regularly furnished, but a staggered feed can be supplied.

This press is designed to accommodate sub-press die sets, which are easily installed by sliding them on top of the bolster through an opening on the left-hand side of the housing. The dies are made with stationary strippers that act as guides for the punches. Heavy, rigid stripper supports are provided at both the front and the rear of the slide. These supports are adjustable by means of set-screws to insure proper contact with the stripper. When desired, cam-operated strippers can be furnished. An "inching" button permits minute movements of the slide.

The press is equipped with an automatic electrically operated device that stops the operation before the tail end of a sheet reaches the punching line, so that any desired margin of unpunched area may be left between the last row of holes and the edge of the sheet. This arrangement obviates the possibility of only a portion of the punches striking the end of the sheet, and thus safeguards against the breaking of fragile punches.

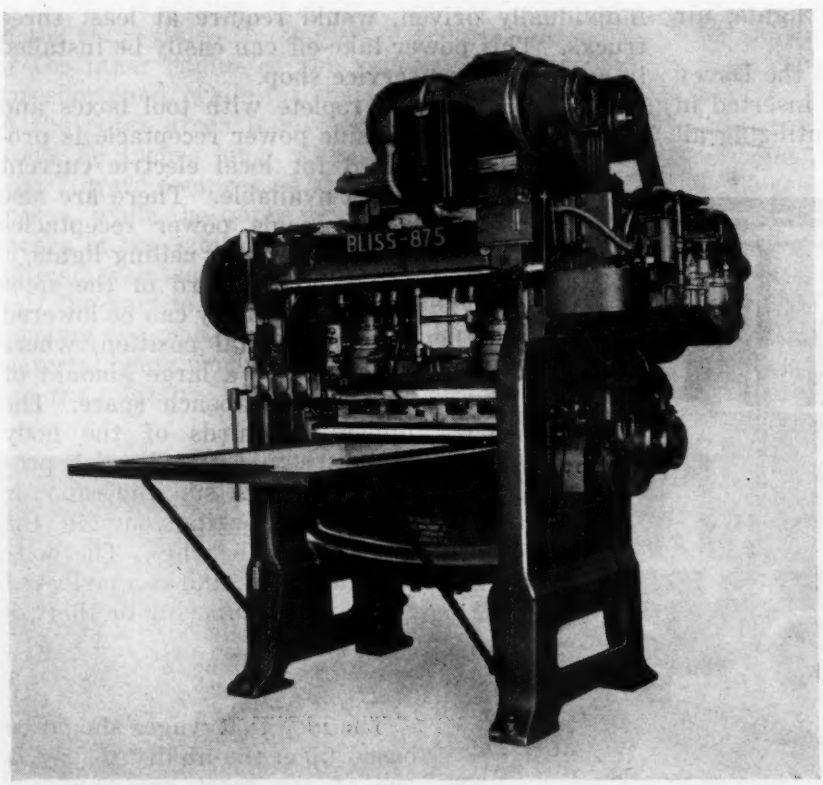


Fig. 1. High-speed Press Built by the E. W. Bliss Co. for Rapidly Perforating Steel Sheets with Slits or Round Holes

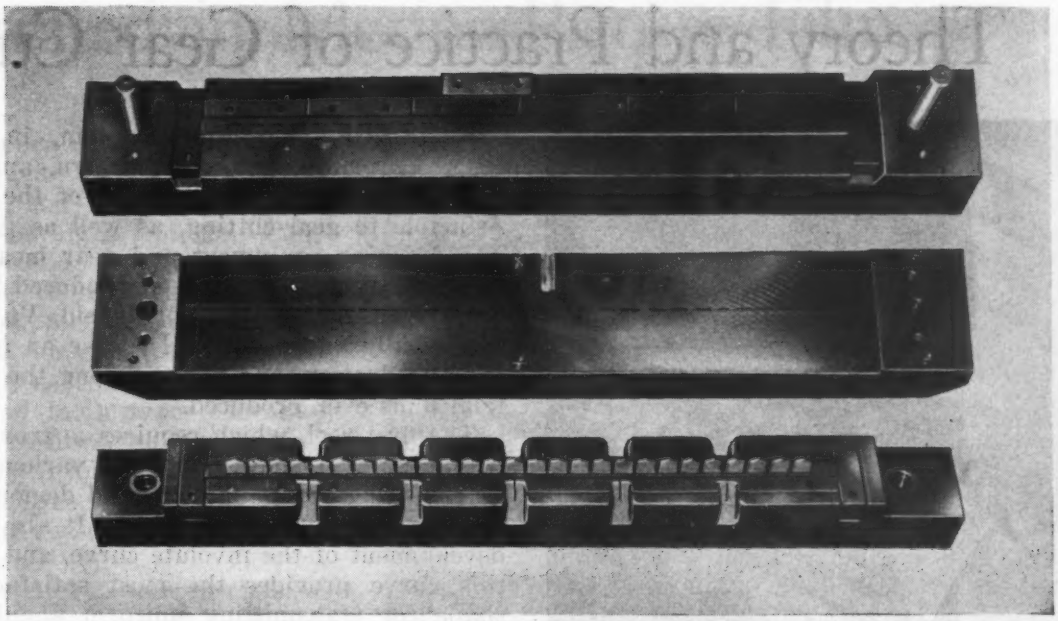


Fig. 2. A Set of Dies Designed to Perforate Twenty-seven Slots 0.031 Inch Wide by 0.75 Inch Long in One Row. The Sub-press Principle of Construction Insures Close Alignment of Upper and Lower Die Members

To start an operation, the operator separates the feed-rolls by releasing a handle and inserts the sheet of steel between side gages. He pulls the edge of the sheet against a back gage which is so adjusted that the front edge of the sheet is safely beyond the line of punches by a proper margin.

Then the feed-rolls are lowered and a push-button is depressed to start the press. As previously mentioned, a safety device stops the operation of the press before the punches reach the edge of the sheet. The feed-rolls are then released and the perforated sheet removed.

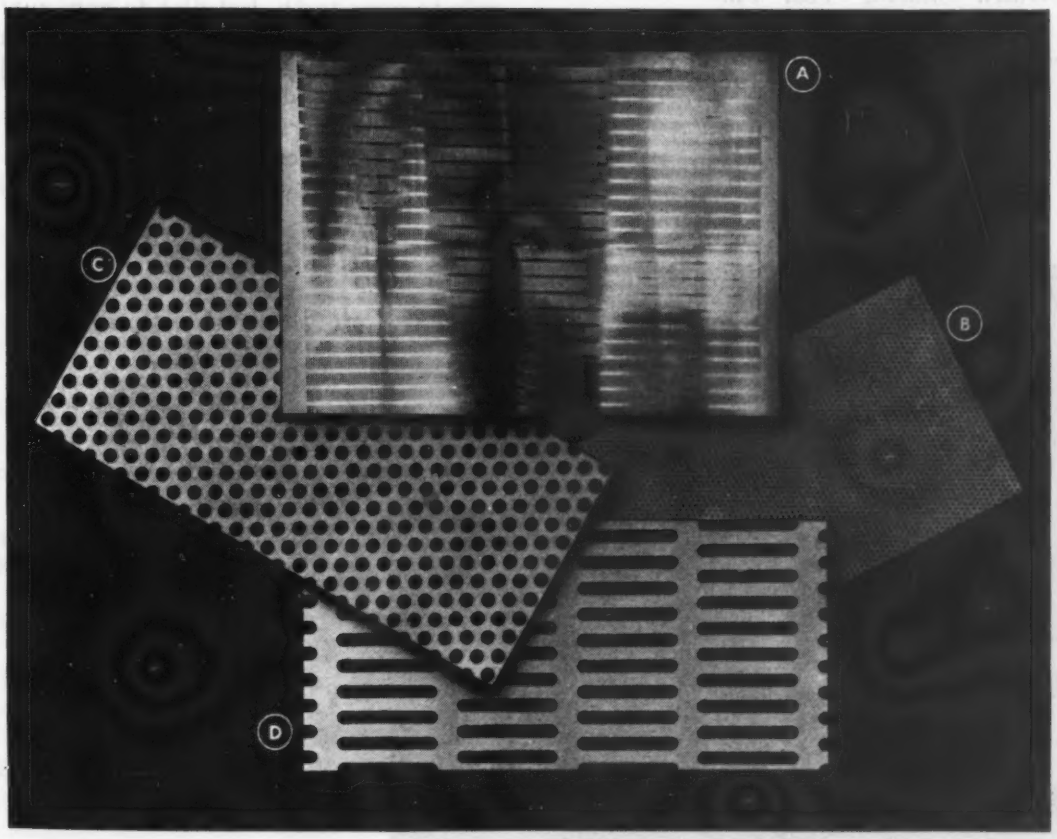


Fig. 3. Examples of Different Types of Perforations Produced on the High-speed Machine Illustrated in Fig. 1

Theory and Practice of Gear Cutting

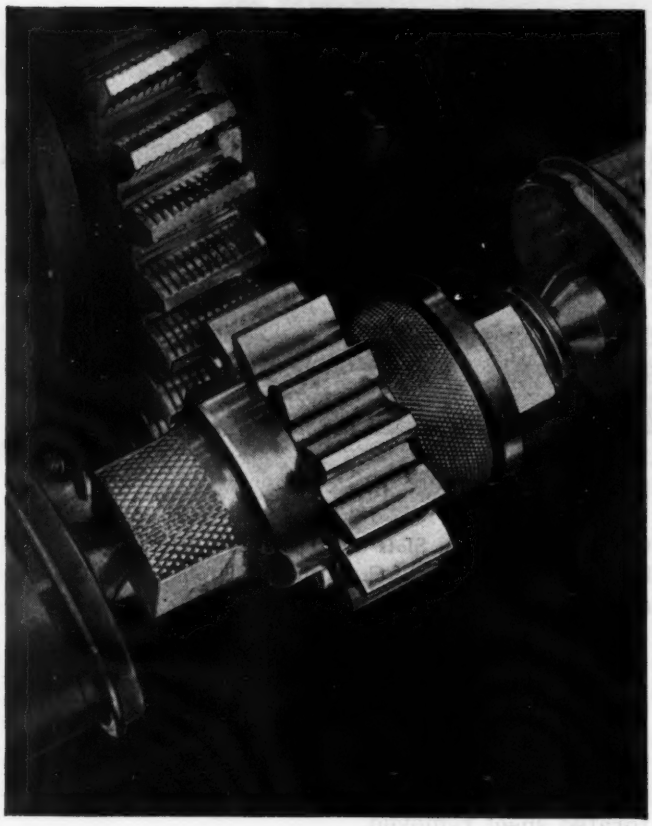


Fig. 1. Serrated Shaving Tool Finishing an External Spur Gear by the Crossed-axes Shaving Method

A COLOR motion-picture film, in two reels, covering the theory, design, and action of gearing and applications of the generating principle to gear-cutting, as well as gear cutting and finishing equipment and gear measuring and testing equipment, has been produced by the Fellows Gear Shaper Co., Springfield, Vt. This film is virtually an educational course on gearing and gear production, and ranks among the best industrial films ever produced.

The first reel, which requires approximately fifteen minutes to show, illustrates various means for transmitting rotary motion, and demonstrates the practical advantages of gears. It also covers the development of the involute curve, and shows that this curve provides the most satisfactory tooth shape for transmitting uniform angular motion. This section of the film is followed by one on the design of gear teeth, showing examples of improperly designed and generated involute gears. The meaning of involute interference, fillet interference, and lack of continuous action is clearly shown.

Errors in gears are impressively demonstrated by loading the gear teeth and photographing the resultant stresses by straight polarized light. Eccentricity and variations in tooth spacing and in pressure angle are also demonstrated. The final section of the first reel shows illustrations of various applications of the generating principle, not only to gear teeth, but also to cam surfaces, irregular-shaped parts, and even a rectangular hole.

The second reel, which requires approximately half an hour to show, demonstrates the use of Fellows gear shapers for cutting gears; it also shows the use of special attachments for performing other machining operations on gear shapers. The

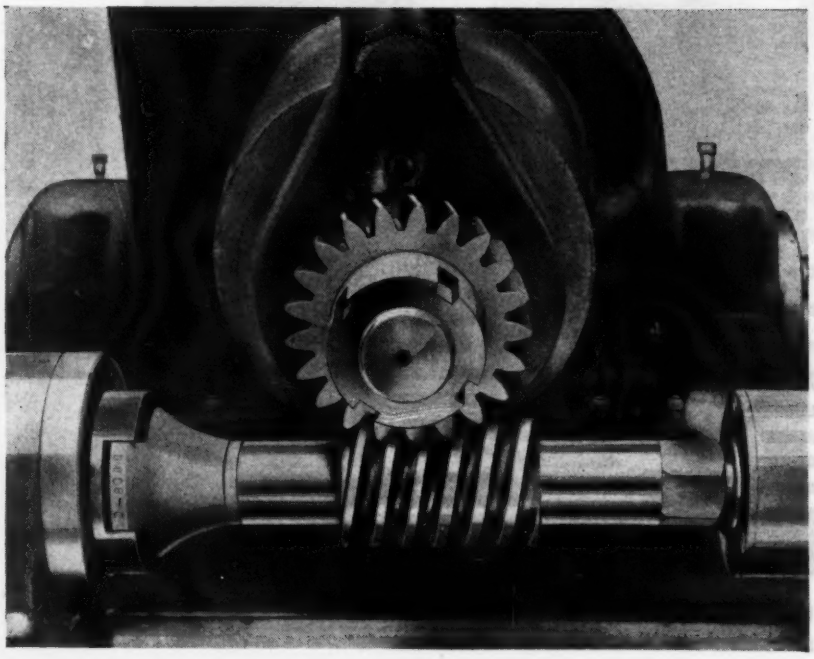


Fig. 2. View Illustrating the Generating of Straight Worms on a Fellows Thread Generator

Illustrated in Motion-Picture Film

use and application of gear shaving machines, gear lapping and gear burnishing, and thread generators for cutting straight and hour-glass type worms are demonstrated. Under the heading "Gear Measuring and Testing Equipment," the film shows instruments for checking tooth elements, such as concentricity, tooth spacing, and tooth taper; involute measuring instruments for checking and charting involute tooth profiles; and the Red Liner type of equipment for checking and charting composite tooth errors.

Reel 1 or Reel 2, or both reels, of this sound movie, can be borrowed for showing by addressing the Publicity Department, Fellows Gear Shaper Co., Springfield, Vt. Those who wish to retain the films permanently may purchase either one or both of the reels at the actual cost of film prints.

* * *

Automobile Industry Celebrates its Golden Jubilee

America's automotive industry is celebrating fifty years of progress with a Golden Jubilee program in Detroit on May 31, sponsored by the Automobile Manufacturers Association. As many of the surviving pioneers as can be assembled will be honored at a public reception and banquet at the Masonic Temple after being conveyed through the city in a cavalcade of ancient cars. Among those receiving awards will be Charles B. King, who built and drove the first car in Detroit on March 6, 1896; J. Frank Duryea, surviving member of the Duryea Brothers firm, makers of early gasoline motor wagons; Henry Ford, father of mass production methods, who drove his first car, a "quadricycle," in Detroit on June 4, 1896; Ransom E. Olds, Lansing, Mich., car builder, who installed the first straight-line progressive assembly system of production; Charles W. Nash, who headed several of the industry's largest automobile companies; and William Crapo Durant, automotive empire builder.

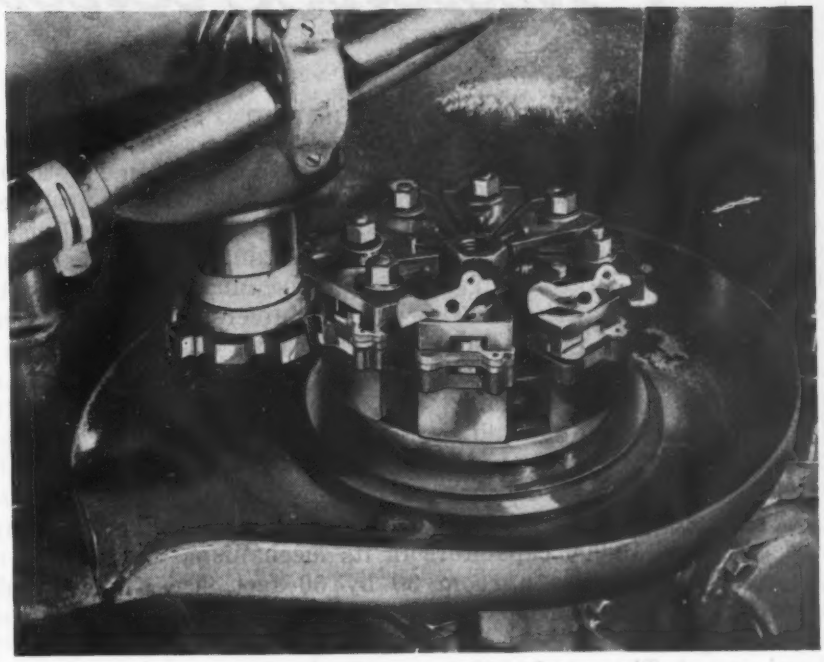
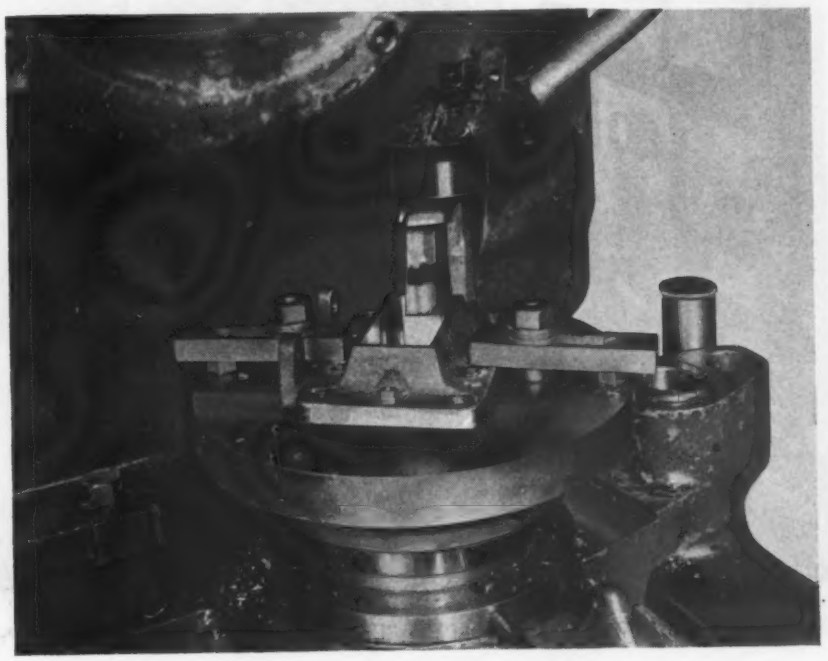


Fig. 3. Machining Irregular-shaped Parts on a Gear Shaper, Using a Special Cutter and Magazine Attachment

Fig. 4. Generating a Rectangular Hole on a Gear Shaper by Means of a Specially Formed Tool



Engineering News

Revolutionary Electronic Calculating Machine

A mathematical robot, known as the "Eniac" (electronic numerical integrator and computer), was designed and constructed for the Ordnance Department by a group of experts at the Moore School of Electrical Engineering of the University of Pennsylvania. The machine is the first all-electronic, general-purpose computer, and is capable of solving many technical and scientific problems so complex and difficult that previous methods of solution were considered impractical or would have taken years on a mechanical machine.

Containing close to 18,000 vacuum tubes, 70,000 resistors, and 10,000 capacitors in its mechanism, the machine occupies a room 30 by 50 feet, as shown in the illustration, weighs 30 tons, and cost approximately $400,000, including research and development. The speed of the computer is phenomenal. The first problem solved on the Eniac, which would have required one hundred man-years of trained computer's work, was completed in two weeks, of which only two hours was actual electronic computing time, the remaining time being devoted to a review of the results and details of the operation. A single addition can be performed in five-thousandth of a second, and several additions can be performed simultaneously. Multiplication, division, and extraction of square roots are also performed in remarkable time. Separate from the Eniac but a part of the installation are two small machines that feed information into the Eniac from punched cards and receive the results in a similar manner. The installation consumes 150 kilowatts of electricity.

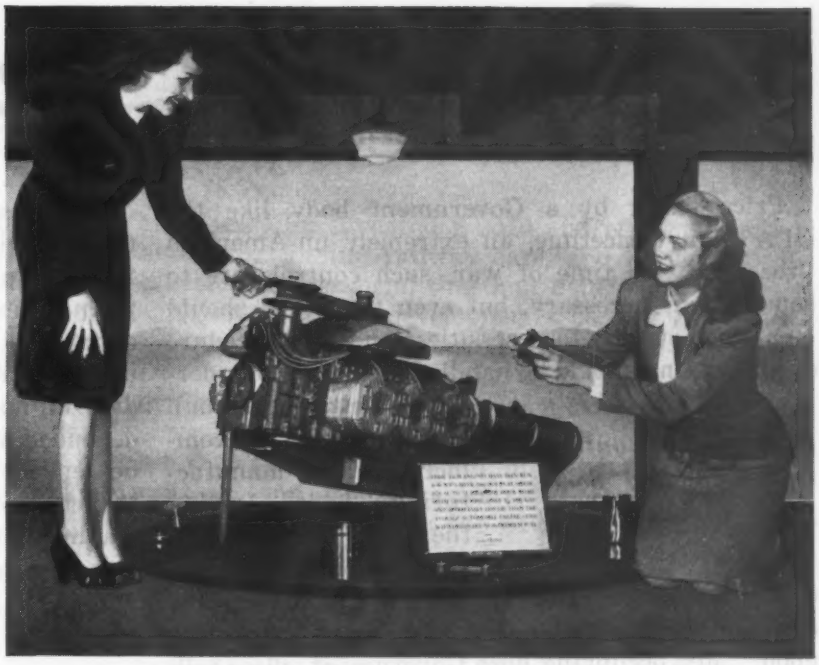
Discoveries made in the development of this project will permit the eventual construction of smaller, faster, more flexible, and cheaper electronic computing devices. In addition to the numerous military applications for which the Eniac was developed, it is expected that there will be many peacetime industrial and scientific applications. A better understanding of electrical phenomena by mathematical analysis will lead to improved products in the electrical and electronics industries. There is a definite need for this type of computer in the design of mechanical products. The solving of meteorological problems will assist in weather research and prediction.

General View of the "Eniac" Computing Machine being Prepared to Solve a Problem

Electric Starter Developed for Aviation Gas Turbines

An electric starting motor rated at 10 H.P. and weighing only 31 pounds has been developed by the Westinghouse Electric Corporation to start jet-propulsion gas turbines for aviation use. The starter brings the compressor and turbine rotor from a standstill to a speed of 2000 R.P.M. in approximately fifteen seconds. The 10 H.P. rating is obtained at 6000 R.P.M., using a 4 to 1 gear ratio, on a 30-second basis. A peak output of 18 H.P. is developed.

Power for the starter is obtained from the 24-volt batteries of the airplane. To obtain maximum power with the least drain on the battery, the motor was designed with impedance to match that of the battery and circuit. The commutation problem caused by an in-rush current of approximately 1800 amperes was overcome by the use of a special grade of halide-treated brush. A multiple-plate friction clutch permits rapid starting with safety.



Cast-aluminum Automobile Engine of Radically New Design

Mobile Radio Telephone System Provides Service for Moving Vehicles

"Telephone secretarial service" and selective ringing are features of the mobile radio telephone system recently exhibited by the Western Electric Co. This new FM development, designed by the Bell Telephone Laboratories for installation in vehicles operating in urban areas, will make immediate contact with any telephone reached by the Bell System.

To make a call from a vehicle, you merely remove the hand-set, give the operator your number, press the button in the hand-set while talking, and release it while listening. At the beginning and end of a day's operation a power switch must be turned. To make a call to a vehicle, you simply ask for the "Mobile Service Operator." Each car will have an individual telephone number, so that only the bell in the vehicle called will ring. If you happen to be absent when called, there will be a light glowing in the control unit upon your return, and you may request the operator to inform you who called.

Compact and of light weight, this equipment comprises a radio transmitter, radio receiver, control unit, antenna, and cable. Operating power for the mobile telephone is derived from a heavy-duty 6- or 12-volt car battery with over-size generator. Other applications of the mobile telephone may include coastal and harbor use on ships, as well as highway, railroad, airplane, police, fire, and forestry service.

Cast-Aluminum Automobile Engine with Horizontal Cylinders

An automobile engine cast from aluminum and incorporating radical features of design has been brought out by Jack & Heintz, Inc., Cleveland, Ohio. This engine is being shown in an exhibit entitled "Aluminum Living," which is sponsored by the Aluminum Company of America and is being presented in cities throughout the United States. The engine unit is equipped with a transmission and clutch designed for use in the rear end of an automobile, and its weight is less than half that of the usual engine. The cylinders are arranged horizontally instead of vertically as in conventional designs. The engine is air-cooled, requiring no radiator. In factory tests, this engine is said to have developed a peak horsepower of 95 with ordinary fuel.

A Transformer that Weighs Only One-Third Ounce

Compact, light-weight transformers, called "subouncers," which were developed for military needs in airborne devices and "walkie-talkie" sets, are now being manufactured for use in hearing aids, vest-pocket radios, and other consumer items by the United Transformer Corporation, 150 Varick St., New York 13, N. Y.

Each transformer is 7/8 inch high by 5/8 inch wide by 9/16 inch thick, and weighs only 1/3 ounce. The coil is wound of Formex wire on a molded Nylon bobbin. Insulation is of cellulose acetate, and the core material is Hipermalloy. The leads are mechanically anchored externally, and the entire unit is triple-sealed to make it waterproof.

Editorial Comment

Price fixing by a Government body like the OPA is, in peacetime, an extremely un-American procedure. In time of war, such controls are to some extent necessary, but even then they should be applied strictly to necessities; and the procedure of price fixing should be handled by men who understand their job through experience in the commercial and manufacturing fields. During the present reconversion period, these price controls must be exercised with even greater care and caution, if they are not to do more harm than good. Men occupying high Government offices talk freely about 60,000,000 jobs, while other Government bureaus appear to do everything in their power to stifle industrial production, and consequently employment. Manufacturers cannot increase production and employment if they are asked to sell their products below manufacturing costs.

Government Controls Once Adopted Seem Hard to Get Rid of

It might be too drastic to expect that all price controls should be abolished at once; so long as there is a scarcity of certain food products and necessary wearing apparel, distributed through tens of thousands of retail outlets, some control appears to be needed to prevent runaway prices on products of this kind. It does not seem necessary, however, to retain price controls in peacetime, even during the reconversion period, on products such as automobiles, refrigerators, electrical equipment, machine tools, and scores of other products made in quantities by a comparatively small number of responsible manufacturers. These organizations can be depended upon to use common sense in setting their prices, since they have a permanent reputation and market to protect; and before long, competition will definitely act as a restraining influence in case any one manufacturer should take undue advantage of the present scarcity, rather than adopting the long-range view. It is futile to talk about free enterprise and individual initiative when a Government bureau can exercise powers that make it impossible for industry to plan ahead. Congress is as much responsible for this condition as the Administration, because of the slowness with which it proceeds and the lack of good sense that it frequently exhibits.

Industry is Still Operating Under a Dictatorship

At present, American industry is operating under a Dictatorship of Bureaucracy, and only the future can tell whether this dictatorship is to be permanent or not. Now that we are at peace, such dictatorial controls should be revoked. As far as the industries are concerned, the good sense of industrial managers in pricing their products can be depended upon in most instances. Certainly it can be depended upon fully as much as, or more than, the caprices of dictatorial Government bureaus, manned largely by men without much industrial or commercial experience.

▼ ▼

The statement of advertising principles recently published by the Advertising Federation of America (330 W. 42nd St., New York 18, N. Y.), emphasizes the desirability of advertising that conveys useful and dependable information. Although there is nothing new in this concept—the points brought out have been stated many times before and have been widely accepted—there is need to pay continued attention to these principles. There is need to drive home the fact that good advertising is good business, as well as good ethics.

Good Advertising is Good Business, and Good Ethics as Well

Good industrial advertising makes a friend because it supplies the reader, who is also a prospective customer, with something that he can use. It leaves a favorable impression and invites him to come back for more information, because the time invested in reading an advertisement has proved profitable. In other words, this kind of advertising is good because it is effective with the kind of people who have the last word when it comes to industrial buying.

To manufacturers of shop equipment and other industrial products, many of whom have devoted a lifetime of specialized study and research to a certain type of equipment, advertising offers an opportunity to talk to customers, and potential customers, about the product they have to offer. Through advertising, the manufacturer can give his customers practical information which they can use in their own work. To the extent that this is done intelligently and conscientiously, the advertising pages of an industrial publication become an important source of usable and dependable engineering data on a wide variety of topics.

One-Hundredth Anniversary of the Birth of George Westinghouse

GEORGE WESTINGHOUSE, the founder of what is now the Westinghouse Electric Corporation, the Westinghouse Air Brake Co., and numerous other well-known manufacturing organizations, was born a hundred years ago this year. In commemoration of this outstanding engineer and manufacturer, the Westinghouse Electric Corporation has published a brief biography dealing with the important events of his life, his inventions, and his business enterprises, the booklet being entitled "George Westinghouse, His Life and His Achievements."

It is of interest to note that George Westinghouse obtained 361 patents, many of them revolutionary in principle. He devised the first effective means for stopping trains—the air brake—and thereby hastened the development of railroads at a time when they were becoming the economic lifeline of the nation. He was also a pioneer in the development of railway signals and interlocking switches. He invented a safe and efficient mechanism for joining railway cars, and he developed a system for transmitting and using natural gas.

Later, electrical developments became his chief interest. He brought out the first main-line electric locomotive, and was also a pacemaker in modern railway electrification. Then came his greatest contribution of all—the practical application of the alternating-current system of generating, transmitting, and utilizing electricity for power and light. He also gave to the power generating field a perfected steam turbine geared to drive ships.

The most interesting thing about this man is that he was not only an inventor, but also a builder of the things that he invented. In the course of his career, he formed and directed more than sixty companies to give concrete form to his ideas, and it is generally recognized that the impact of his leadership radically changed the course of industrial history in America.

Substitutes for Tin in Manufacturing

IN a paper read before the annual meeting of the Society of Automotive Engineers at Detroit, Mich., C. E. Heussner, materials engineer, and E. T. Johnson, project engineer, with the Chrysler Corporation, furnished some comprehensive information relating to tin as applied in the industries. It was pointed out that the United States consumes approximately 40 per cent of the world's supply of tin, the four principal uses being for tin plate, bronze and brass, solder, and babbitt.

The establishment of stringent Government controls at the beginning of the war caused a marked reduction in the consumption of tin for various purposes in the industries. The decreased consumption of tin in tin plate was due principally to the substitution of electroplating for dipping in tin-can manufacture. There were also earnest efforts made to decrease the use of tin in solder, babbitt, and bronze. According to the Bureau of Mines, there was a decrease in the tin content of the average solder from 38 per cent of tin in 1939 to 29 per cent in 1943. The average percentage of tin in babbitt decreased, too, materially in that period.

In the automotive industry, efforts were made to substitute other materials for tin to as great an extent as possible. An analysis of engineering requirements and results of tests indicate that in numerous cases good performance might be anticipated by the following means: (1) For moderate conditions of service, brass bushings or bronze bushings of decreased tin content can be used successfully; (2) Solid bronze bushings can be changed to steel-backed bronze bushings; (3) hardened steel, in some cases Parkerized, can replace bronze in some thrust bushings and thrust pads; (4) plastic thrust washers can be used; and (5) a method has been developed to bronze-coat steel thrust washers by successively copper-plating and tin-plating.

Bronze springs were more difficult to replace with tinless material. However, during the war, the redesign of springs permitted replacement of the bronze with carbon steel.

The engineer's goal throughout the war period was to insure an adequate tin supply for all essential production. A relatively easy post-war tin supply was anticipated. This, however, has not materialized. The best available information indicates that we will probably face a serious shortage in tin supply for a number of years; hence it is advisable, both for the present and for some time in the future, that industry continue its efforts to become increasingly independent of tin.

The greatest savings in tin can be made in the following ways: (1) Redesigning parts to eliminate the use of tin entirely; (2) making such improvements in processing as will require the least amount of tin; (3) developing alternate materials, preferably those that can be produced in this country. By the application of these three methods, tin consumption per automobile was actually cut from 4 pounds in 1940 to 2 pounds in 1945.

Higher Wages and Less Efficiency is a Dangerous Combination

In a recent address by Henry Ford II, president of the Ford Motor Co., Mr. Ford gave some figures from the company's books that constitute real "fact finding." Those labor leaders who have been calling for the opening of the books of manufacturing companies to fact-finding committees may not be so pleased when it is found that the actual facts indicate that labor in the automobile industry today, while being paid more, produces less. These are the figures given by Mr. Ford:

The Super De Luxe Tudor is the most popular of the Ford cars. In 1941, this car was rolling off the final assembly line at a total manufacturing cost of $512. It took 87 labor-hours to build; the material cost was $304; the direct labor costs were $76; and the overhead amounted to $132.

Twelve months later, in 1942, the total manufacturing cost of this car had risen to $681. At that time it took 102 hours to build; the material cost was $343; the direct labor costs were $124; and the overhead was $225.

Looking now at the November, 1945, cost records of the same car, when the production was comparatively small, we find that the total manufacturing cost had risen to $962—41 per cent more than in 1942 and 87 per cent more than in 1941. It took 128 labor-hours to build. This figure, said Mr. Ford, demonstrates why the Ford company has sought assurances of increased worker output from the union. Lower costs cannot be achieved if this trend of decreasing productivity on the part of labor is not reversed. The total labor cost rose to $152—double that in 1941—and the overhead costs increased to $354, considerably more than double the figure for 1941. It should be noted that "overhead" includes the cost of plant maintenance during work stoppages.

The figures quoted are merely manufacturing costs; they do not include the costs of sales and distribution nor any return on the capital invested. Adding the distribution costs, but allowing nothing as a return on capital invested, the total cost for each car sold in November, 1945, was $1041.26.

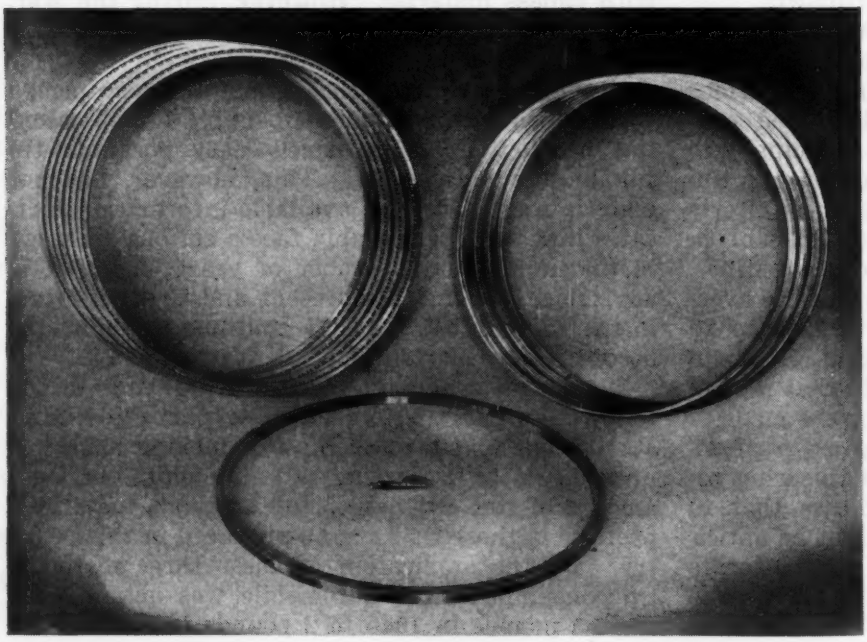
To top the climax, it should be mentioned that in that same month—November, 1945—the Ford organization was authorized by the Office of Price Administration to sell for $728 this car which cost the company, without any profit whatsoever, $1041. In other words, the Office of Price Administration asked the Ford company to sell at a loss of nearly $300 per car.

* * *

Unusual Type of Narrow Large-Diameter Ball Bearings

To produce ball bearings only 3/4 inch wide, using 3/8-inch balls, with an outside diameter of 32 inches and an inside diameter of 30 1/2 inches is not a simple matter. Such bearings were made by the Kaydon Engineering Corporation, Muskegon, Mich., for requirements arising during the war. These bearings, of angular contact design, take thrust load in one direction. With two bearings mounted in opposed positions, radial loads, as well as thrust loads, in both directions are taken care of. Ball bearings of the design described are unusually light in weight.

The chief problems to be solved in manufacturing such thin bearings were those of holding the rings during machining and grinding and of avoiding distortion during heat-treatment. These difficulties were overcome by using pot chucks and plugs in each stage of machining and grinding, and employing special fixtures in heat-treating to keep the rings round and prevent them from changing size. The inside and outside diameters were both ground to limits of plus or minus 0.001 inch.



Large-diameter Narrow Ball Bearings that Presented Problems in their Manufacture. These Thin Precision Bearings are especially Applicable where Minimum Weight and Free Movement are Essential

Tool Engineering IDEAS

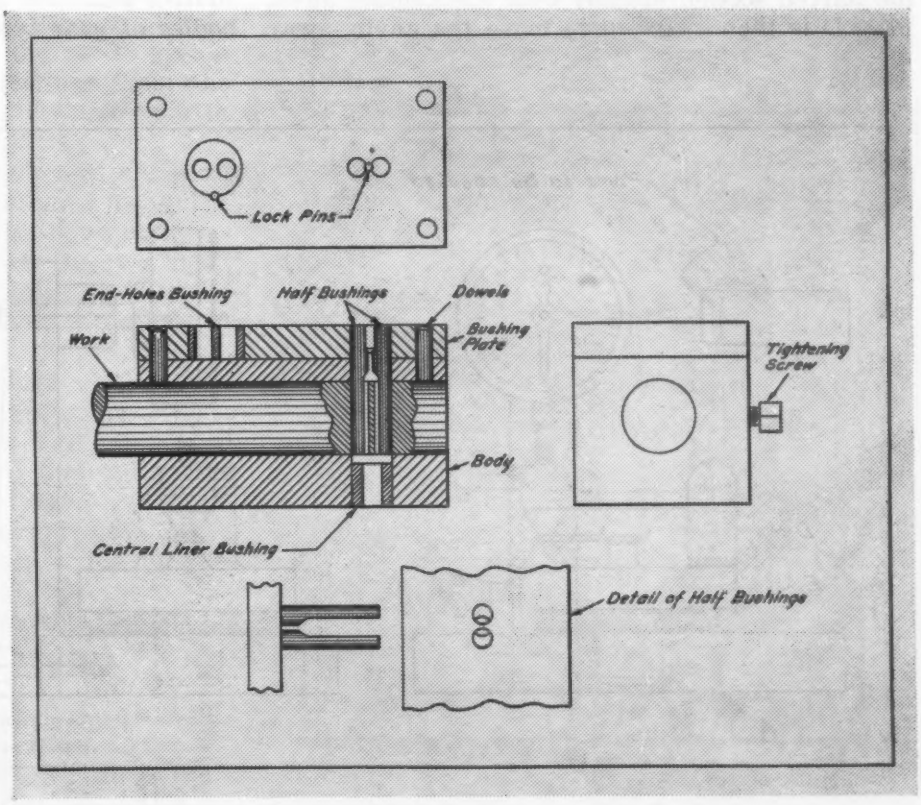
Slot-Drilling Jig with Half-Bushing Guide for Drill

By H. MOORE, Leeds, England

Crosswise slots which are somewhat longer than twice their width can be produced in round shafts by drilling out the metal with the aid of a jig equipped with a half-bushing, as shown in the accompanying illustration. Three drill penetrations are necessary, one at each end of the slot and one in the middle. Usually no difficulty is experienced in drilling the end holes, but the removal of the narrow strip left between them is often the cause of broken drills and scrapped work. It was especially for this awkward part of the job that the jig here illustrated was designed.

The body of this jig is drilled and reamed to receive the work as shown. It is also tapped for a tightening screw, and drilled and reamed to receive the central liner bushing. Before this liner bushing is driven into place, however, the bushing plate containing the end-hole liner bushing and the half-bushing pins is finished. This is a flat piece of steel with holes near each corner which are sliding fits on four dowel-pins driven into the jig body. The bushing plate carries at one side a bushing for use in drilling the end holes, and at the other side the two pins that are to form the half-bushing for guiding the drill that removes the metal left between the two end holes.

To simplify the location of these pins in the bushing plate, a piece of work is tightened in the jig and the two end holes drilled through the holes in the liner bushing made for this purpose. The plate is then reversed on the dowels, and the jig turned over for drilling the half-bushing pin-holes in the plate. For this operation, the drill is guided by the holes just drilled through the work. The pins are then driven into the plate, pinned, and the plate placed again in the same position, this time, of course, with the pins extending through the work. The central liner bushing is then driven into place and the narrow strip between the end holes drilled, while at the same time, the half-bushing pins are drilled out, leaving their ends with a crescent-shaped cross-section, as shown in the lower right-hand view of the illustration. The half-pin bushings thus formed are then hardened.



Jig with Reversible Bushing Plate for Drilling Three Closely Spaced Holes through Shaft to Produce Crosswise Slot

The sequence of the slot drilling operations is as follows: Tighten work in jig, place bushing plate on jig with liner bushing over slot position, and drill out end holes. Next reverse plate, pressing half-bushings into holes and turn jig over for drilling middle hole. This can be done as easily as would be the case if the metal were all one solid piece, because the half-bushing, guiding the drill completely through the work, effectively prevents any tendency of the drill to run out at either side while being fed through the shaft.

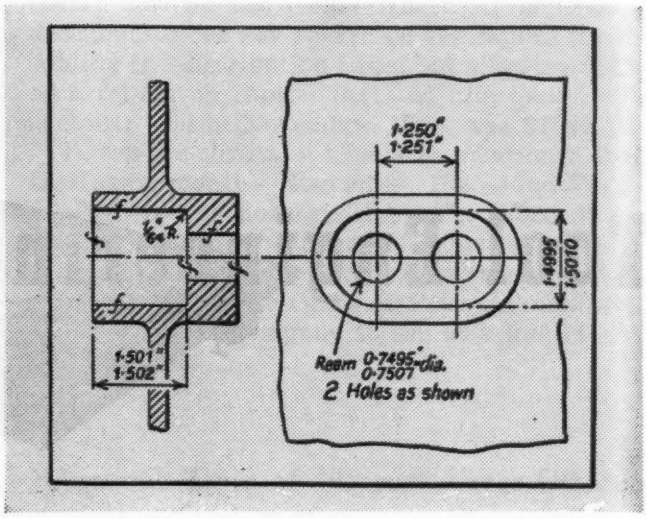


Fig. 1. Dimensions for Machining Accurate Cavity in Pump Body which is Integral Part of Large Magnesium-alloy Casting

Gage for Checking the Height of Burrs

By PETER L. BUDWITZ, Meriden, Conn.

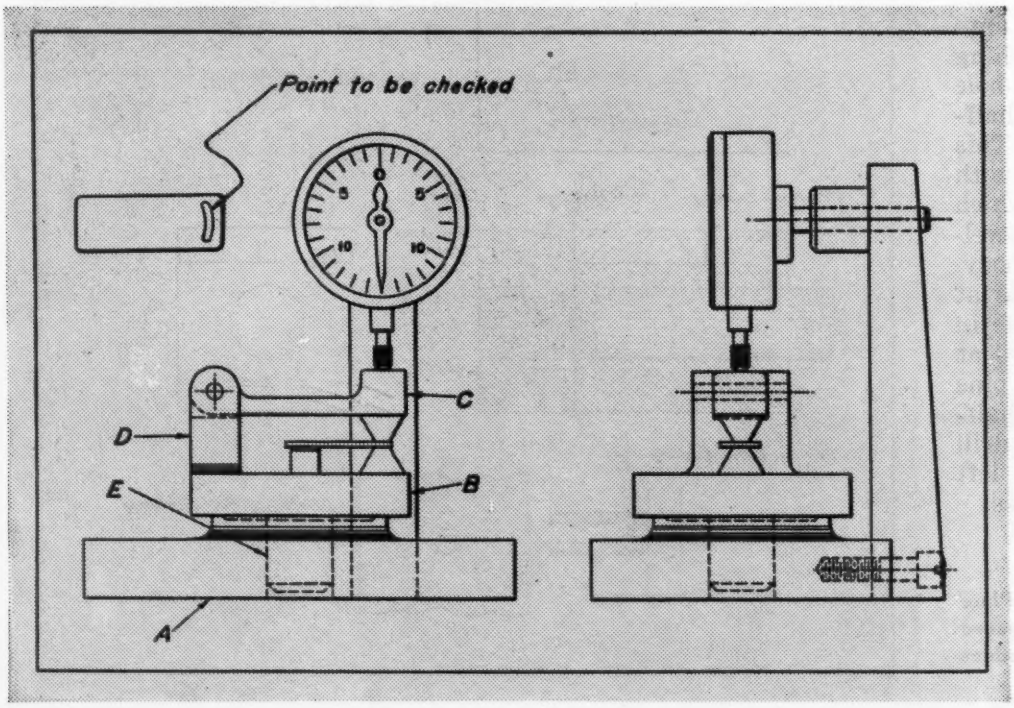
The accompanying illustration shows a gage that was developed for checking the height of burrs on blanked sheet-metal parts, in order to keep the height of such burrs within established tolerances. When the dial indicates that a burr is higher than permissible, the tool must be sharpened or some other adjustment made. This gage has been effectively used by inexperienced operators who were unable to use micrometers for such purposes with consistent results.

As shown in the illustration, the gage consists of a dial indicator mounted on an upright bar, which is fixed to base *A*. A contact and rest anvil *B* and a pivoted anvil *C* are pinned together to form hinged part *D*. Part *D* is free to swivel on base *A*, being piloted on shaft *E*.

The piece to be checked is placed on the contact and rest anvil *B* in such a position as to localize the burred section directly over the contact anvil. Part *D* is then swiveled to move the anvils away from the indicator contact point, and pivoted anvil *C* is brought down on the piece carefully. Next, part *D* is rotated until the approximate center of the anvil is in contact with the indicator plunger, and the indicator reading is taken.

Jigs and Fixtures Designed for Milling Gear-Pump Body Cavities

The drill jigs and milling fixtures shown in the accompanying illustrations were developed in a British plant for use in machining cavities in the bodies of gear type oil-pumps like the one shown



The Height of Burrs on Stamped Parts can be Compared with Predetermined Standards by Means of This Gage

in Fig. 1. The pump forms an integral part of a large and somewhat intricate magnesium-alloy casting. Owing to the size of this casting, it is impractical to swing it in a lathe, and hence the necessity for machining the body cavities by drilling and milling operations on machines having tables that are large enough to accommodate the work.

For the first operation, the casting is mounted on a drilling machine table with the previously finished top face in position for drilling and reaming two 0.736-inch diameter holes, using the jig shown in Fig. 2. This jig has two 0.736-inch bushings, spaced 1.250 inches between centers. Two sides of this box type jig which are at right angles to each other serve to locate the casting positively. Clamping is accomplished by the three set-screws *A* whose axes are inclined slightly from the horizontal position to provide the desired clamping action.

In this operation, as in succeeding drilling operations, should the fixture show a tendency to creep vertically and there is no exterior clamp available, a spacing piece may be used between the radial arm of the drilling machine and the fixture face. Both holes are rough-counterbored to a diameter of 1 3/8 inches and to a depth of 1.45 inches, using a standard two-wing piloted bar and cutter. The holes are finish-counterbored to a diameter of 1.4995 inches and to the required depth, using a piloted nose type counterbore.

The excess material in the center of the cavity is removed or roughed out by a 1 7/16-inch diameter face cutter, using the jig shown in Fig. 3. This consists of a bushing plate *A* carrying a 1 7/16-inch diameter bushing at *B*, and two hardened steel inserts at *C*, which are secured in machined recesses, each by three socket-head screws. These inserts are accurately machined and set to give a positive jig location in both directions from the counterbores. Side clamping by set-screws with inclined axes secure the jig.

The 1.4995-inch width is now copy-milled to blend with the radii of the counterbores, using the copy-milling fixture shown in Fig. 4. This comprises a box type jig, located from the two hardened inserted radial pads *A* and fixed horizontally by dowel-pins, together with the two hardened superimposed copy plates *B*.

The 0.7495-inch diameter holes are next reamed, using the special bushing plate shown in Fig. 5. This consists of a box type fixture with a hardened locating plate at *A*, screwed and doweled to the body, which, in turn, carries two 0.7495-inch diameter bushings at *B*. The clearance *C* is provided in the locating plate for the reamer. Clamping is effected as in the other cases.

To avoid excessive work setting, this last opera-

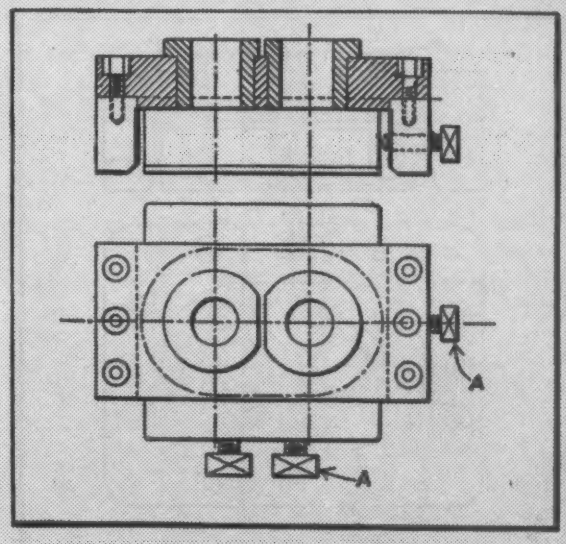


Fig. 2

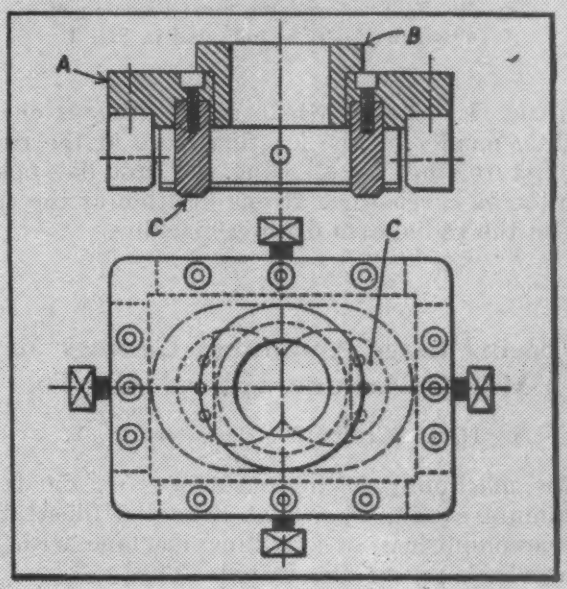


Fig. 3

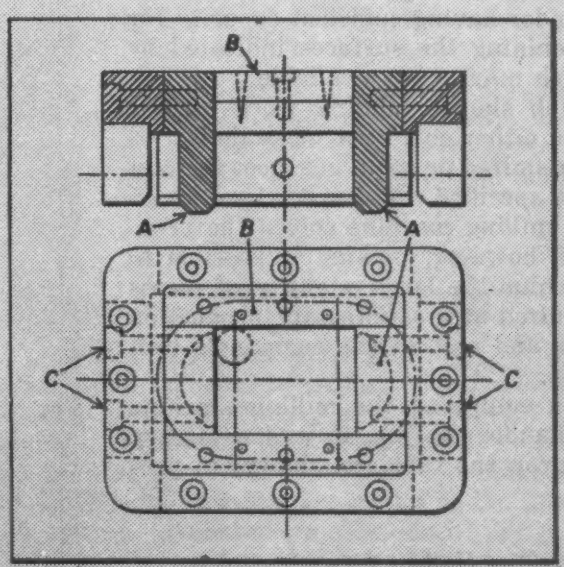


Fig. 4

Fig. 2. Jig for First Drilling and Reaming Operation on Pump Cavity. Fig. 3. Fixture Used in Removing Excess Material from Pump Cavity. Fig. 4. Copy Type Milling Fixture Used in Machining Cavity in Part Shown in Fig. 1

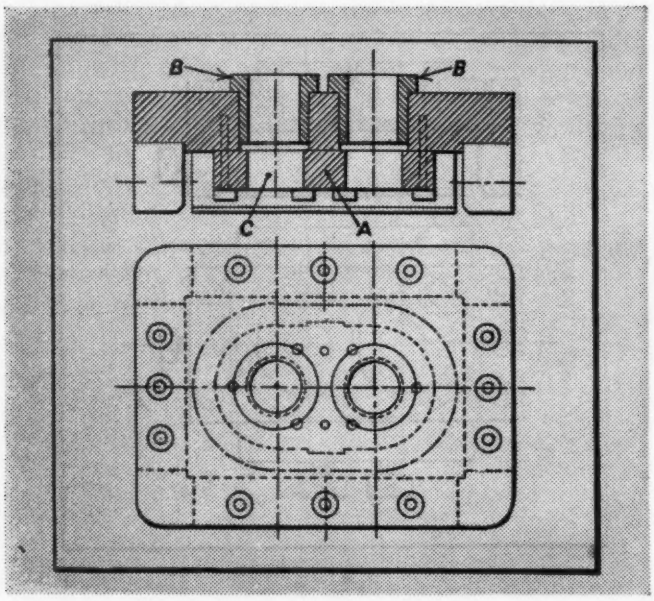


Fig. 5. Jig Employed for Final Reaming of 0.7495-inch Holes, as Indicated in Fig. 1

tion can be performed before the previous one by slightly modifying the locating plate of the reaming fixture, thereby allowing the first five operations to be carried out at one location of the casting on the radial-arm drilling machine.

Facing Large Aluminum Castings on a Milling Machine with a Lathe Tool

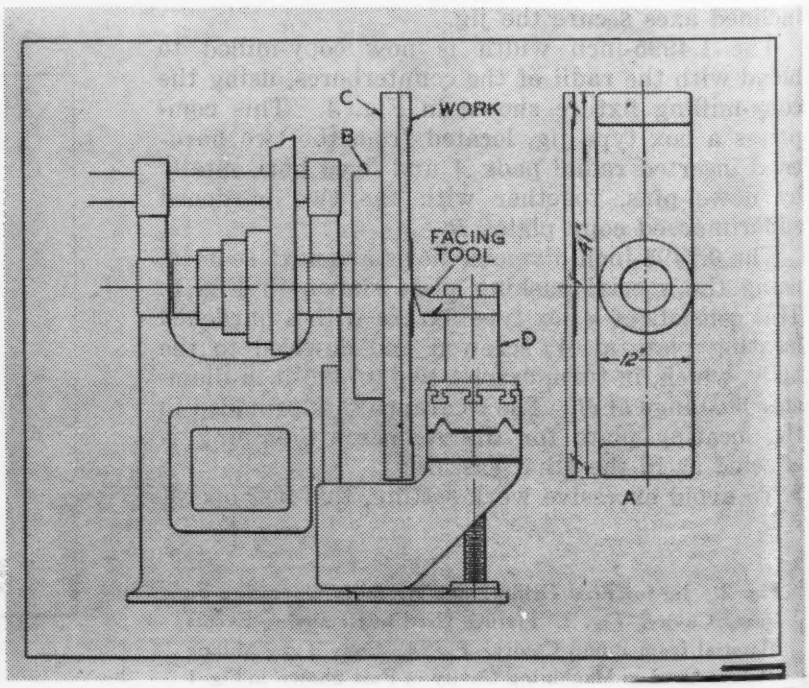
By H. A. SCHREIBER, Hempstead, N. Y.

The machining of three surfaces on the large aluminum casting shown at *A* in the illustration was accomplished on a milling machine with the improvised set-up illustrated. This unusual arrangement was devised because no engine lathe, planer, or grinder having sufficient capacity for machining the surfaces indicated by finish marks was available.

Job shops handling work of this kind either could not make deliveries as required or could not meet the cost rate specified. The special set-up on the milling machine solved the problem, however, making it possible to machine the large quantity of pieces required at a satisfactory production rate and cost in the company's own shop.

In equipping the milling machine to handle the job, it was necessary to drop the table, as shown, to provide sufficient clearance to permit the work to swing. An adapter was made for the milling machine spindle to take the largest faceplate *B* in the shop, which was 24 inches in diameter. Two pieces of 1 1/4- by 2-inch cold-rolled steel *C* were bolted to the faceplate to support the work for its full length of 41 inches.

A special toolpost *D* was constructed by welding to compensate for the additional height from the table to the center of the milling spindle. The regular milling machine feeds proved ideal for feeding and controlling the movements of the facing tool.



Milling Machine Set-up Devised for Facing Large Aluminum Casting with Lathe Tool

* * *

New Officers of Resistance Welder Manufacturers' Association

At the last regular meeting of the Resistance Welder Manufacturers' Association, which was held in Detroit, the following officers were elected to serve during 1946: President, H. B. Warren, executive vice-president, Thomson-Gibb Electric Welding Co., Lynn, Mass.; vice-president, G. N. Sieger, president and general manager of S-M-S Corporation, Detroit, Mich.; executive secretary, George A. Fernley, Philadelphia, Pa.; and secretary-treasurer, H. R. Rinehart, Philadelphia, Pa.

* * *

Film on Induction Heating

A color sound moving picture has been produced by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., showing applications of induction heaters. This film, entitled "Metal Magic," runs for twelve minutes and shows the speed of operation and easy control of induction heaters. The film is available from the Allis-Chalmers' advertising department.

An Ex-Prisoner-of-War Writes to MACHINERY

The routine inquiry on a post-card was recently varied somewhat by one of our correspondents who, in asking for the name of the manufacturer of a certain product, casually mentioned that he had come across a description of this product while reading old copies of MACHINERY in an internment camp. In supplying the information, the Editor indicated his curiosity as to the circumstances attendant on this inquirer's perusal of our magazine, and was rewarded with the following letter:

Dear Editor:

Picture yourself in an internment camp in the Philippines—Los Banos to be exact. A foraging expedition within bounds has unearthed several old copies of MACHINERY. Exultant, you carry them off, guard them from similar marauders, and in the boredom of confinement and exclusion from world activities, you settle down with your immediate friends of misfortune to pore through them, advertisement by advertisement, page by page, literally committing to memory some of the articles, and entering in a notebook information you hope some day to use when the wheels of chance shall once more throw you back into civilization. Rescue by the United States Army, return to the States, and a small salvaged notebook to remind you of the magnitude the printed word, as manifested in a few copies of a trade magazine, could assume in a life of privation.

This is the story behind my inquiry for the manufacturer of Seal-Cote.

J. M. NICHOLAS
Los Angeles, Calif.

* * *

Steel in the War

A publication entitled "Steel in the War," distributed by the United States Steel Corporation, assembles, for the first time, facts and figures that measure the importance to the national security of this basic metal. This book records some of the industrial feats performed by the steel industry in general, and by the United States Steel Corporation in particular, operating under the American system of free enterprise in the greatest war of all time, a war that was fought with weapons and equipment made largely from steel.

It is of interest to note that the American steel industry increased its annual production during the war years by 70 per cent over 1939, and produced the gigantic total of 467,000,000 tons of steel in the five years ending July 31, 1945.

"Steel in the War" traces the development of many new steels and new uses of steel that were invaluable to our armed forces and to our allies and that are now available for post-war needs. The story of the steel helmet and the landing mat for planes, the perfection of the high-pressure steam turbine to drive ships faster and further with less fuel, the free-fall cargo package for supplying front-line troops by air, the heat-resisting steel tubes for jet propulsion planes—these and scores of other production achievements are described.

* * *

Checking Employes' Vision

Detection of employes who are visually unfit is possible by the use of a "Sight-Screener" instrument developed by the American Optical Co., Southbridge, Mass. This instrument is portable,

Using the "Sight-Screener" to Check the Vision of an Employe in a Machine Shop

and can be carried directly into a factory for quickly spotting those employes who need eye examination and correction. The instrument is shown in the illustration being used in the shop.

* * *

Stainless-Steel Tubing Data Chart

A slide-chart has been made available by the Carpenter Steel Co., Welded Alloy Tube Division, Kenilworth, N. J., containing a large amount of information pertaining to stainless-steel tubing. This slide-chart gives various areas for different tube diameters, the physical properties of the principal grades of Carpenter stainless-steel tubing, a table showing the theoretical bursting pressures for different tubing sizes, and a table giving the weights of round tubing.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

A Non-Deforming Die Steel that Hardens in Heavy Sections

A new patented tool steel known as "Vega" has been added to the line of tool, alloy, and stainless steels made by the Carpenter Steel Co., Reading, Pa. It is an air-hardening, non-deforming die steel that has the deep-hardening characteristics of air-hardening steel and responds to the low-temperature heat-treatment possible with oil-hardening steels.

The new steel is a manganese-chromium-molybdenum steel with other alloys added to give the desired toughness combined with maximum hardenability. Because it can be heat-treated at a temperature 200 degrees F. lower than 5 per cent chromium air-hardening steels, it does not require high-temperature furnaces. When properly heat-treated, Vega steel may be expected to expand only 0.0005 inch per inch of length, and upon drawing at 400 degrees F., will return to within 0.00025 inch per inch of length of its original size. It is especially suited for tools used in blanking, piercing, trimming, and forming sheet metal in both light and heavy gages. 201

New Featherweight Structural Material Developed in Aircraft Field

"Metalite," a featherweight material possessing high strength and a mirror-like exterior, has recently been announced by the Chance Vought Aircraft Division of United Aircraft Corporation, Stratford, Conn. This new structural material consists of thin sheets of high-strength aluminum alloy, separated by a thick, low-density core of balsa wood and bonded firmly together to form a single light, rigid unit. The grain direction of the balsa core is set perpendicular to the metal faces. A core material of greater density than balsa can be used in spots where increased strength is desired. The core is relatively thick in comparison to the metal plates.

Metalite is constructed by bonding the core and metal sheets together under moderate heat and pressure, all the bonds being ordinarily made in one operation. The bonding is done with the parts or assembly in a mold of the desired shape. For flat work, the parts are normally put together on a bench, and the whole assembly placed in a mold afterward. For curved work, both single and double, several different forming methods can be used. When only gentle curves are required, the work can be assembled flat on a bench and the entire assembly placed in a mold and forced into the desired shape by the application of pressure.

Because of the thickness provided by the light core, the bending stiffness of a completed Metalite panel is many times greater than that of a simple sheet of metal of the same weight. The hard metal faces of the product cannot be easily damaged, and panels can be walked on without injury to the material. Applications in many industries are indicated. 202

Cleaner Suitable for Use in Any Type of Water

A soapless cleaner that lathers instantly in hard, soft, or sea water and can be used effectively to clean grease-caked heavy machinery is being manufactured by the K. P. Chemical Co., 16 W. 46th St., New York 19, N. Y.

This solvent, designated "K.P.," was used in wartime for removing grease and grime from marine engines and cargo areas. When mixed with sea water, it was found effective in removing oil from basins and drydocks. It has been used in the heavy steel and machine tool industries for cleaning large castings and grease-coated machinery. 203

Silver Brazing Flux Reaches Maximum Fluidity at Low Temperature

A silver brazing flux known as "Nu-Braze Wonderflux No. 4," which melts at 480 degrees F., has been developed by Sherman & Co., 197 Canal St., New York 13, N. Y. Since this flux melts well below the oxidation temperatures of most metals and forms a protective coating over the metal surface, it tends to prevent the formation of oxides. At 800 degrees F., the compound is of a water-thin consistency and will readily flow through clearances as small as 0.001 inch. Because of its thin consistency at brazing temperatures, this flux is completely eased out of the joint by the molten brazing alloy, thereby eliminating any difficulties due to flux inclusions.

To obtain additional information on materials described on this page, see lower part of page 240.

For all practical purposes, it is chemically neutral, and can be painted on parts and allowed to remain for long periods without producing corrosion. It contains no free fluorides, does not release large quantities of noxious fumes, and after the water content has boiled away at 212 degrees F., does not continue to effervesce, making it particularly useful where brazing alloys are used in the form of powder. 204

Process for Polishing Stainless Steels Electrolytically

A process for polishing stainless steel electrolytically, developed by the Rustless Iron and Steel Division of the American Rolling Mill Co., 3400 E. Chase St., Baltimore 13, Md., has proved in many cases to be faster and more economical than mechanical methods. Electropolishing is the reverse of electroplating in that the work is the anode and metal is removed from it. The amount of metal removed by this process depends upon the time of immersion, condition of the surface, and current density. Normally, about 0.0005 to 0.001 inch of metal is removed in five to ten minutes, and as much as 0.0015 to 0.002 inch after ten to twenty minutes.

Almost all grades of stainless steel can be electropolished, although some respond better than others. The Rustless patented electrolyte consists of approximately 55 to 60 per cent industrial quality citric acid, 15 per cent sulphuric acid, and the remainder water. 205

Copper Alloy Provides Unusual Strength and Hardness

A new copper alloy, known as "Viculoy," with unusual strength and hardness properties is being produced by the Akron Bronze & Aluminum Co., 579 Washington St., Akron, Ohio. This alloy is made in three types—Nos. 1, 2, and 3—to suit various requirements.

Viculoy No. 1 is recommended for use when nonferrous castings, such as aluminum bronze, manganese bronze, gear bronze, or yellow brass, are required. It has an ultimate strength of 85,000 to 90,000 pounds per square inch, an elongation in 2 inches of 4 to 12 per cent, a Rockwell B hardness of 94 to 96, an impact strength of 10 foot-pounds, and an endurance limit of 32,000 pounds per square inch. It is recommended for gears, pinions, flash- and butt-welding dies, bronze-welding electrodes, and heavy-duty welding wheels.

Viculoy No. 2 is used when hard drawn pure copper is needed, such as in current-carrying parts. It has higher creep and fatigue strength and greater wear resistance than hard-drawn copper, while still retaining the same density, coefficient of resistivity, coefficient of expansion, modulus of elasticity, and corrosion resistance.

Viculoy No. 3 can be heat-treated to obtain unusual physical properties, as compared with both ferrous and non-ferrous alloys. It is applicable where castings must withstand shock loads, abuse, pressure resistance, high speeds, and exceptional strains without fatigue. It is non-magnetic and non-sparking, and has an ultimate strength of 160,000 to 170,000 pounds per square inch, a Rockwell C hardness of 38 to 42, endurance limit of 52,000 pounds per square inch, and an impact strength of 3 foot-pounds. It is recommended for gears, die molds, non-sparking tools, small machine parts, and precision bearings and bushings. ..206

Enthone Enamel Stripper Removes Organic Coatings

A new enamel stripper designated S-300 has been developed by the Enthone Co., 442 Elm St., New Haven, Conn., for the removal of many types of organic coatings. Synthetic enamels, such as aklyds, melamine, and urea formaldehyde coatings, are readily removed with this stripper. The enamels are removed cleanly by a wrinkling action, leaving the work clean and bright. The stripping compound does not attack the base metal nor are phosphate or anodized coatings affected by its action. 207

Plastic Glazings Tested for Automobile Windows

A demonstration of the safety features of plastic glazings for automobiles was viewed recently by twenty-five automotive industry engineers—members of a sub-committee of the Society of Automotive Engineers' technical board—in tests conducted at the Rouge plant of the Ford Motor Co. In the Ford tests, a leather bag filled with 12 pounds of shot was swung from various heights against the plastic glazings to demonstrate the superior safety features of the plastic material.

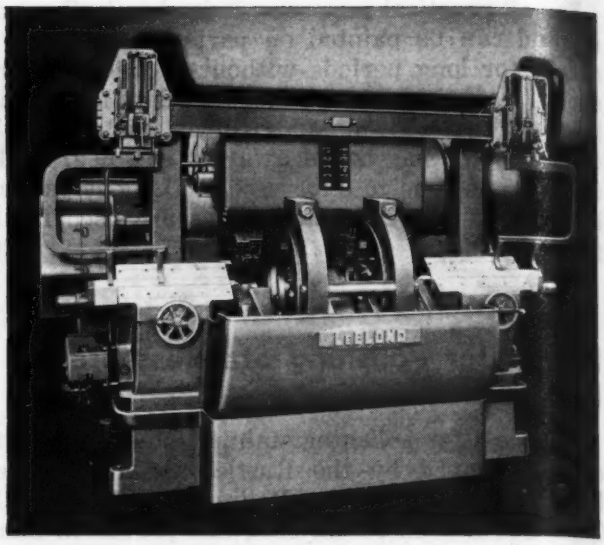
This plastic material in its present form is not suitable for windshields due to its susceptibility to scratching under prolonged windshield wiper operation. 208

Liquid Carburizing Process Simplifies Salt Removal

A new liquid carburizing process that makes it easy to remove all traces of salt from oil-quenched work has been announced by the Park Chemical Co., 8074 Military Ave., Detroit 4, Mich. This process, which is known as "Karbo Kasing," makes use of equipment by means of which a small flow of oxygen is discharged into a molten bath containing "Karbo Kase" salt. This is a powdered-cyanide base salt, completely water soluble, in which is incorporated a carbon cover. 209

To obtain additional information on materials described on this page, see lower part of page 240.

Shop Equipment News



Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

LeBlond Automatic Crankshaft Lathes

Four new automatic crankshaft lathes have been introduced on the market by the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. These machines have been developed to obtain even more completely automatic operation and higher production rates than were possible with the earlier line of LeBlond crankshaft lathes, the manufacture of which was interrupted by the war.

This improved line of machines consists of the Model 6AC lathe shown in Fig. 1, which is adapted for rough- or finish-turning all pin bearings; the Model 7ACL, Fig. 2, developed for rough-turning all line bearings; the Model 1LB, Fig. 3, which rough- and finish-turns the line bearings; and the Model DM, Fig. 4, for finishing line bearings.

Although there is some slight overlapping of functions, these four machines complement each other and represent a well-rounded line of automatic crankshaft lathes for performing all turning operations, such as rough- and finish-turning, filleting, cheeking, and shaving.

The two-spindle 6AC automatic crankshaft lathe is built for simultaneously rough-turning or simultaneously finish-turning pin bearings on both spindles. The crankshafts are held and driven from both ends in hydraulically operated pot type chucks. Two master crankshafts (enlarged duplicates of the crank to be machined) govern the movement of the tools throughout the cycle of rapid traverse to the starting point of the cut, feeding movements to the sizing stop, and rapid return.

A cam of predetermined design permits varying the feed of any part of the cut. Automatic stopping of the spindle at any predetermined position is accomplished by means of a dynamic reversing switch. The control circuit is interlocked with the chuck operating valve. Average production on this machine ranges from thirty to fifty cranks per hour.

The 7ACL single or double center drive machine is designed for rough-turning all line bearings in one operation. The driving head and tools

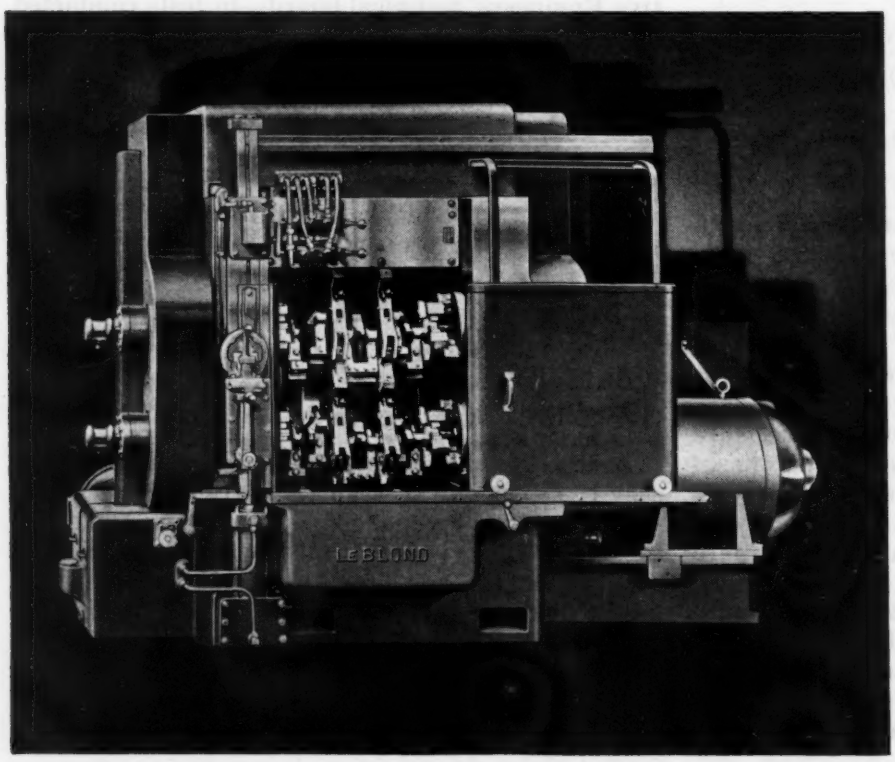


Fig. 1. (Left) LeBlond Automatic Two-spindle Crankshaft Lathe

Fig. 2. (Above) LeBlond Single or Double Center Drive Lathe for Rough-turning Line Bearings

To obtain additional information on equipment described on this page, see lower part of page 240.

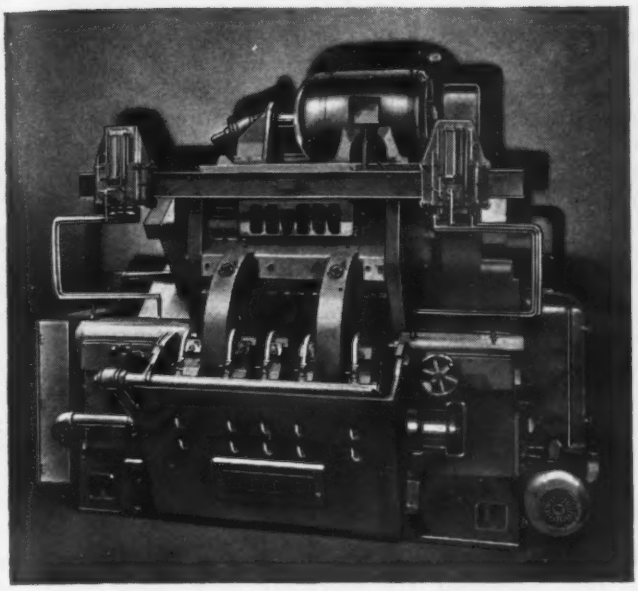


Fig. 3. LeBlond Single-spindle Crankshaft Lathe for Rough- and Finish-turning Line Bearings

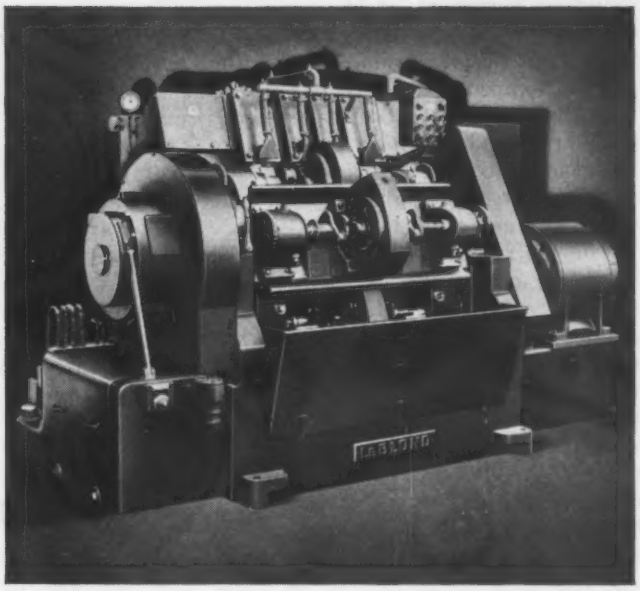


Fig. 4. Four-station Revolving-drum Crankshaft Lathe for Finish-turning Line Bearings

and the mechanical feed are electrically driven. Dwell is provided at the end of the cut to permit removal of the rough tool marks. This machine is equipped with an air-operated carrier crane to facilitate placing the crankshafts in the machine and removing them after the machining operation. Average production is fifteen to twenty-five cranks per hour.

The 1LB single-spindle lathe, with either single or double center drive, is equipped with separate sets of tool units for simultaneously rough- and finish-turning all line bearings and the flange and stub ends of crankshafts. Two sets of cutting tools, which move in opposite directions, rough out all line bearings. These tools are followed by a set of finishing tools, mounted on a separate tool unit which moves inward from a third direction for finishing the previously roughed-out surfaces.

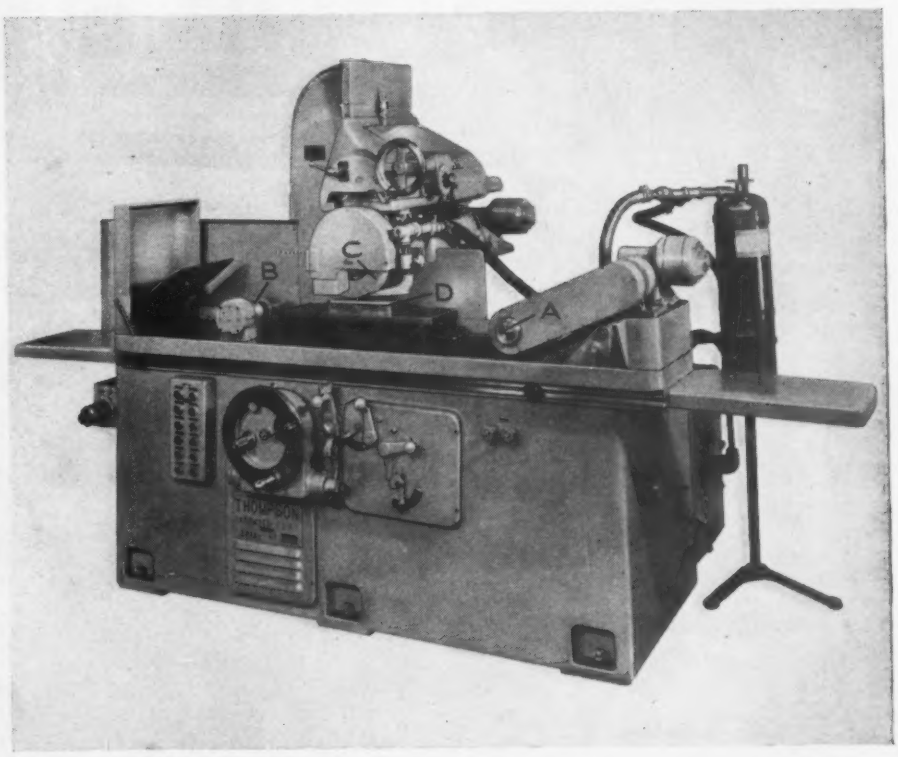
The finishing tool unit provides a positive, smooth dwell of predetermined duration for sizing the work and also contains a coolant system. In addition, this unit acts as a chip guard and apron for protection of the operator. Power is furnished by combination electric-hydraulic motor units controlled by readily accessible electric push-buttons, which, in turn, actuate switches, solenoids, and electric relays and contactors. The average production on this machine is twelve to twenty cranks per hour.

The DM four-station indexing machine is built on the revolving-drum principle for use in finish-turning line bearings, and is designed to completely eliminate all rough-grinding operations. The addition of the fourth station for loading makes possible continuous operation.

This lathe also is driven by combination electric-hydraulic motor units controlled by readily accessible push-buttons. It is equipped with a red and green control light system which not only protects the operator, but also provides a visual check on work progress. Production averages from 30 to 40 cranks an hour. ——71

"Truforming" Grinder with Wheel-Forming Crusher Rolls

The Thompson Grinder Co., Inc., Springfield, Ohio, has developed a new contour grinding process known as "Truforming," in which two crushing rolls mounted on the grinder table are used to keep the form-



"Truforming" Grinder for Production Grinding Precision Flat Form Contours

To obtain additional information on equipment described on this page, see lower part of page 240.

grinding periphery of the wheel accurately shaped to the required contour. The accompanying illustration of a Thompson Type B "Truforming" grinder shows the two crushing rolls at *A* and *B* which are used to maintain the wheel *C* in condition for accurate form-grinding of the upper surface of work *D*.

The roll at *A* is used for initial crushing and truing of the wheel *C* to the form required for contour-grinding the work *D*. The crushing roll *B* at the opposite end of the table is used for touching up the wheel to bring it back to the perfect contour required when the accuracy of the roll at *A* has become affected through repeated truing of wheel *C*. After being touched up, the wheel can be run at full speed against the crushing roll at *A* to restore its original true form by regrinding. All this is accomplished without disturbing the wheel, work, or rolls.

All measurements, including those for the starting position of the wheel and the down-feed limits for crushing, grinding, truing, and touching up are figured from the same checking point, which is the work height. All equipment required for these operations is mounted on the machine table to assure the accurate alignment necessary for the finest precision work. Automatic size compensation, automatic crushing and truing limits, automatic grinding and interlocked grinding, and truing cycles are all features made possible on these new "Truform" grinders.

All "Truform" grinders are equipped for duplicating master rolls. This duplication can be accomplished before production grinding is started, so that a sufficient number of rolls is on hand to insure completing the entire contour grinding job. Compensation for retruing of the grinding wheel with respect to the finished height of the work is accomplished automatically by a single setting of the down-feed handwheel stop. This is an important feature, especially in grinding thread forms, as it is necessary to hold accurate pitch-line dimensions.

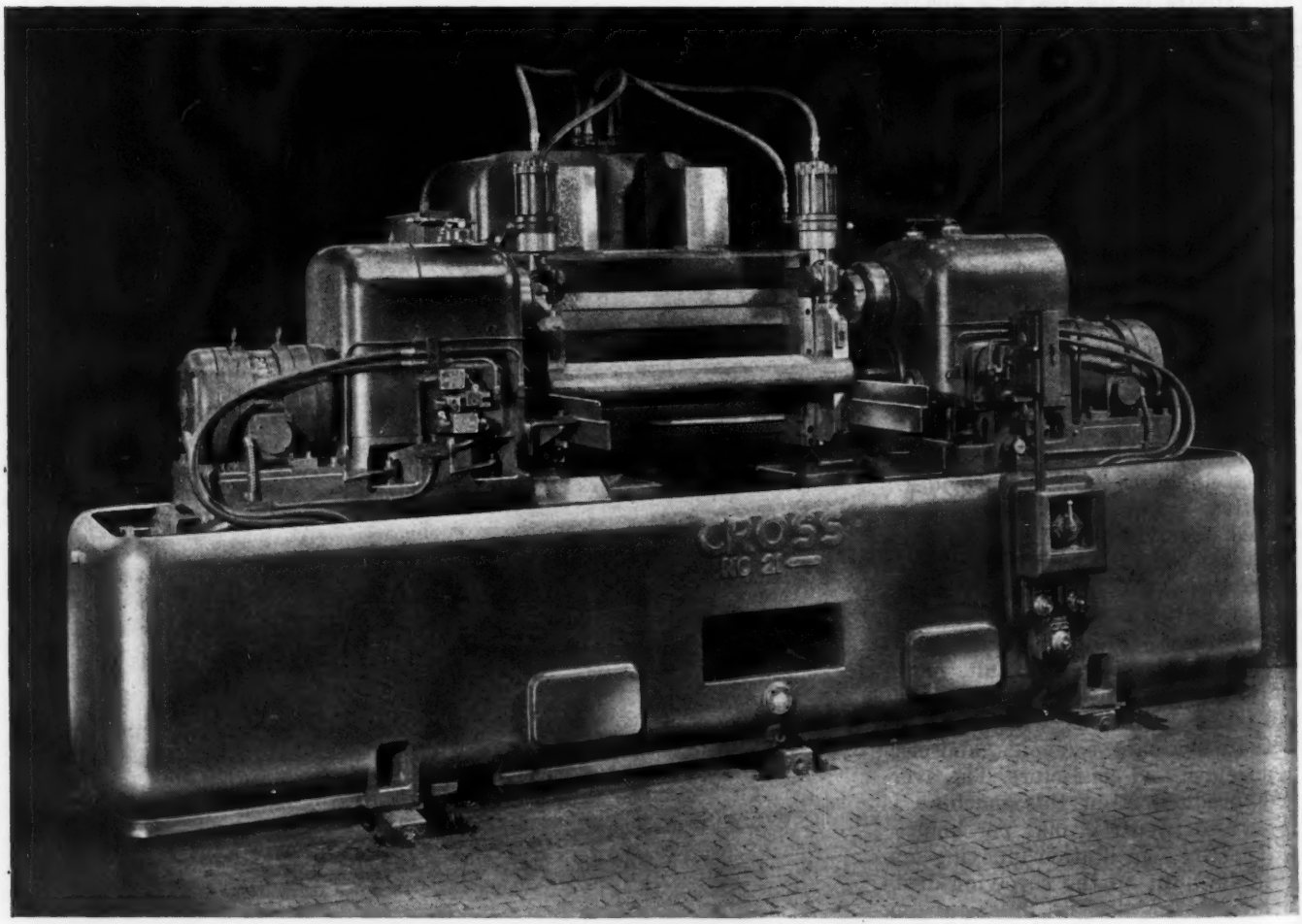
Precise intricate contours such as thread forms, serrations, laminated die segments, and any other contour having very close tolerances can be ground with one pass of the wheel over the entire contour. 72

Shaft Facing and Centering Machine

The Cross Co., Detroit 7, Mich., has brought out a new universal machine designed for the rapid production facing and centering of shafts in sizes ranging from 1 1/4 to 6 inches in diameter and in lengths from 9 to 48 inches. This machine has been developed to obtain the utmost cutting rigidity by supporting the work and the cutters very close to the cutting point.

The machine is fully automatic, the operating cycle being controlled by push-buttons. The shafts to be centered are rolled from loading rails into the clamping jaws and hydraulically clamped at each end. The work is then fed upward for milling both ends, after which the carbide cutters retract and the work is lowered for centering and unloading.

With this machine, fifty average



Shaft Facing and Centering Machine Brought out by the Cross Co.

To obtain additional information on equipment described on this page, see lower part of page 240.

shafts are faced and centered on both ends in one hour. The hydraulic feeding and traversing heads connected with the work clamps can be quickly and easily positioned when changing over from one size of shaft to another, the average change-over time being about ten minutes.—73

Davis & Thompson Four-Station Indexing Machine for Milling, Drilling, and Tapping Motor Frames

Milling, drilling, and tapping operations are performed simultaneously on electric motor frames by a four-station indexing machine recently developed by the Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis. Provisions for interchangeable fixtures and drill plates make it possible to change over the set-up on this machine from one size motor frame to another in approximately one hour. The machine will handle twelve sizes of frames, from No. 203 to No. 405, inclusive, through the substitution of fixtures and drill plates.

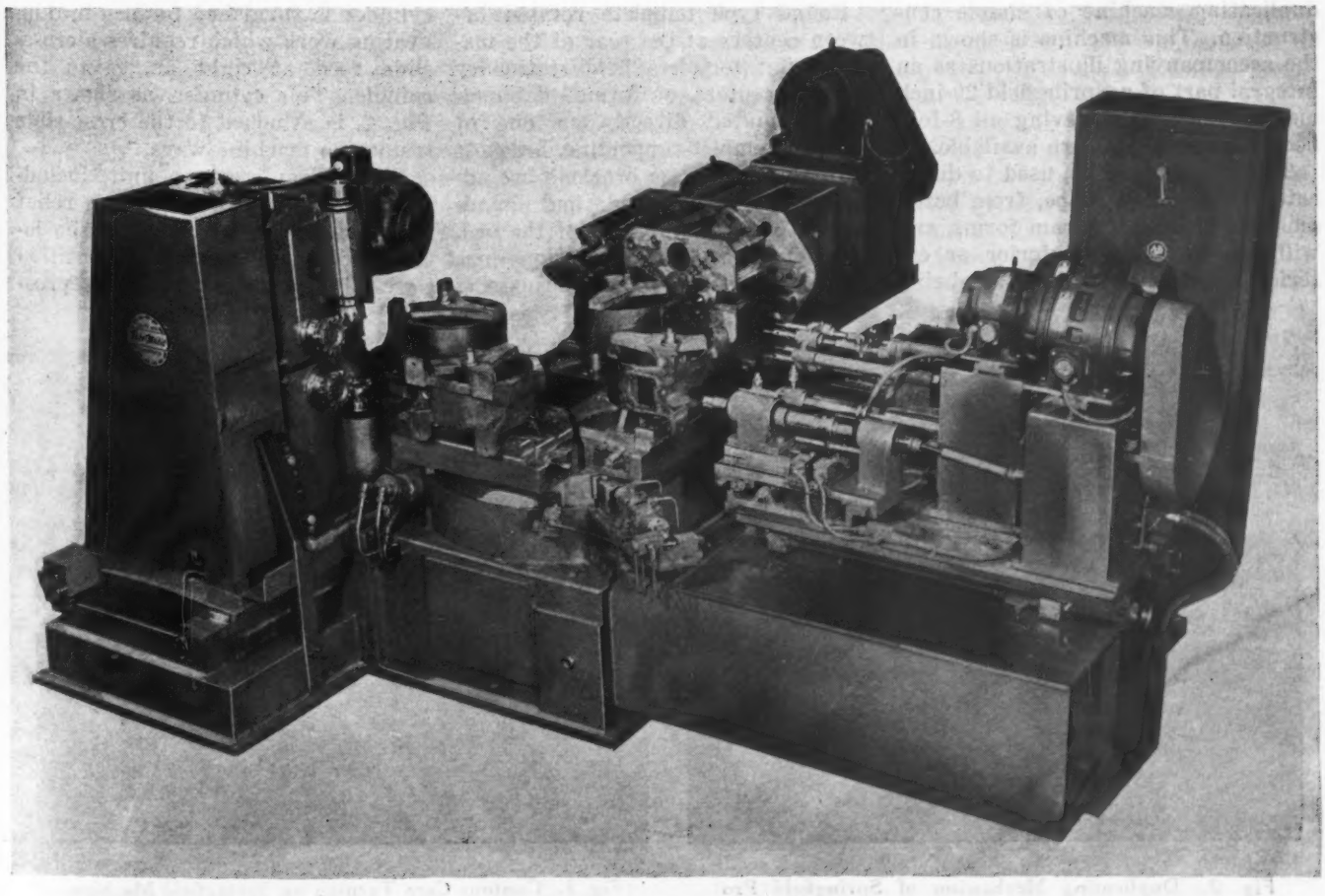
The cycle of operations includes loading at the first station; milling base of pads, and milling pads to the required width at the second station; drilling four mounting holes, four conduit box holes, central set-screw hole, and bottom conduit pipe hole at the third station; and tapping four conduit box holes, central set-screw hole, and bottom conduit pipe hole at the fourth station.

Indexing of the table is accomplished by means of a hydraulic motor through a worm and worm-wheel drive. The milling head is equipped for rapid traverse and change to cutting speed. The heads for drilling the mounting holes are equipped with change-gears to obtain the correct spindle speed. The head for drilling the conduit holes has a two-speed quick-change gear-box. The drill spindles can be adjusted to suit the various sizes of motor frames.

All machine heads are electrically interlocked, and must be in their correct starting positions before the operating cycle can be started. The drilling heads are fed by hydraulically operated screws, and the tapping heads are positioned and given rapid return movements, with cushion action at either end of the stroke, by means of hydraulic cylinders. All taps are controlled by a lead-screw. Each cutter-head is equipped with a 10-H.P. motor. The drill heads have 7 1/2-H.P. and 3-H.P. motors, and the tapping heads have three 3-H.P. motors. The three hydraulic pumps are driven by one 7 1/2-H.P. and one 3-H.P. motor. The machine weighs 51,500 pounds. Production varies according to the size of the motor frame, and ranges from forty No. 203 to twenty No. 405 frames per hour.—74

Lincoln Improved Stainless-Steel Electrodes

The Lincoln Electric Co., Cleveland 1, Ohio, has developed two improved electrodes known as Stainweld A7 and A7-Cb for shielded-arc all-position welding of stainless steels of the 18 per cent chromium and 8 per cent nickel type. Improved Stainweld A7, which replaces the A7 electrode discontinued during the war, is recommended for use with stainless steels designated by the American Iron and Steel Institute as Nos. 304 and 308. It produces an ex-



Four-station Indexing Machine Built by Davis & Thompson Co. for Milling, Drilling, and Tapping Motor Frames

To obtain additional information on equipment described on this page, see lower part of page 240.

tremely smooth and steady arc, with easy slag removal, and is suitable for operation on direct current or on the higher voltage type alternating-current welding units. It is available in 1/16-, 5/64-, and 3/32-inch sizes, in lengths of 18 inches, with center grips, and in 1/8-, 5/32-, and 3/16-inch sizes, in lengths of 14 inches, with end grips.

Stainweld A7-Cb is columbium - stabilized, and has operating characteristics similar to Stainweld A7. This electrode is recommended for use with stabilized 18–8 stainless steels designated by the American Iron and Steel Institute as Nos. 321 and 347. It is furnished in the 3/32-inch size, in 18-inch lengths, and in 1/8-, 5/32-, and 3/16-inch sizes, in 14-inch lengths. All-weld metal specimens have a tensile strength of 85,000 to 95,000 pounds per square inch.....75

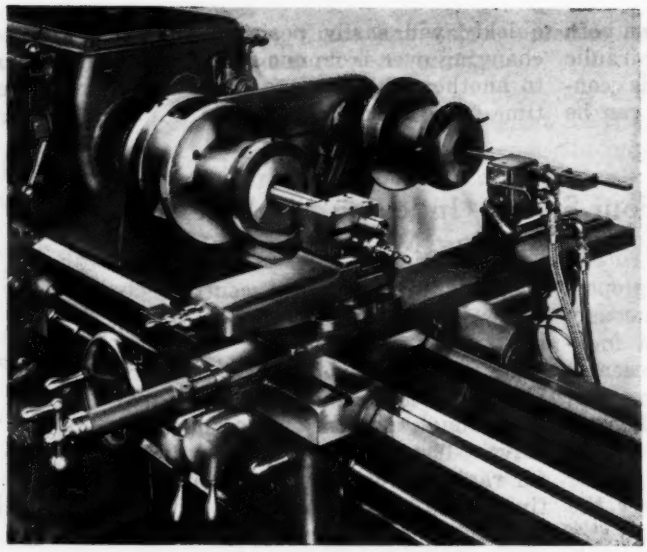


Fig. 1. Springfield Hydraulic Profiling Machine Set up for Duplicating Bottle Mold, Using Original Mold as a Master

Springfield Hydraulic Profiling Machine

The Springfield Machine Tool Co., Springfield, Ohio, has developed a versatile hydraulic profiling and duplicating machine of simple construction. This machine is shown in the accompanying illustrations as an integral part of a Springfield 20-inch medium-duty lathe having an 8-foot bed, but other sizes are available.

The machine can be used to duplicate parts of any shape, from bottle molds to complicated cam forms, and will perform either interior or exterior duplication operations, being particularly adapted for rapid, economical reproduction of intricate work.

Round type templets rotated between centers at the rear of the machine, flat templets held stationary between centers, or formed flat templets mounted directly on one of the two templet-supporting brackets can be used. These brackets are adjustable on machined and hand-scraped ways at the rear of the bed. Templets requiring rotation are driven by means of an adjustable chain drive directly from the machine spindle, the driving mechanism being enclosed by a metal guard.

Any one of twelve spindle speeds can be selected by means of three levers on the headstock. These twelve speeds can be reduced, when required, by means of a two-speed motor. Spindle speeds as low as 5 and 6 R.P.M. are available for duplication of intricate designs. The various feeds are obtained in the usual manner through a standard gearbox.

Most of the duplicating mechanism is carried on the cross-slide, which is designed to overhang the rear of the bed sufficiently to permit mounting the stylus control valve on top of the slide. This valve can be swiveled to accommodate templets of various contours and types. On the under side of the slide is mounted the master hydraulic cylinder, which is controlled by the stylus, for duplicating work that requires the carriage to be traversed parallel to the machine spindle. Another master cylinder is furnished for use in duplicating work which requires a cross-slide feed at right angles to the spindle. This cylinder, as shown in Fig. 2, is attached to the cross-slide inside the machine ways.

The hydraulic pump unit, including oil tank, motor, pump, relief valve, and pressure gage can be located in any convenient position close to the machine. Flexible pres-

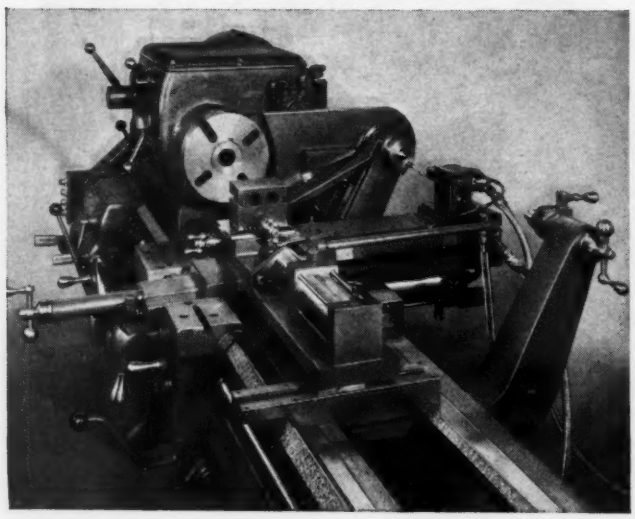


Fig. 2. Duplicating Mechanism of Springfield Profiling Machine Set up for Use with Cross-feed

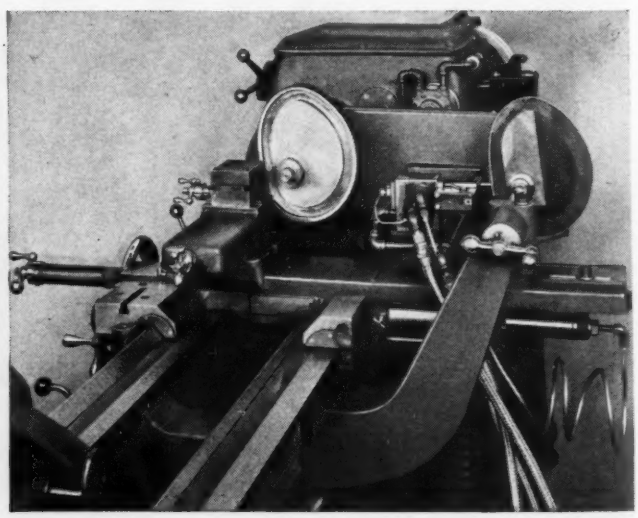


Fig. 3. Contour Cam Turning on Springfield Machine, Using a Revolving, Flat, Thin, Sheet-metal Templet

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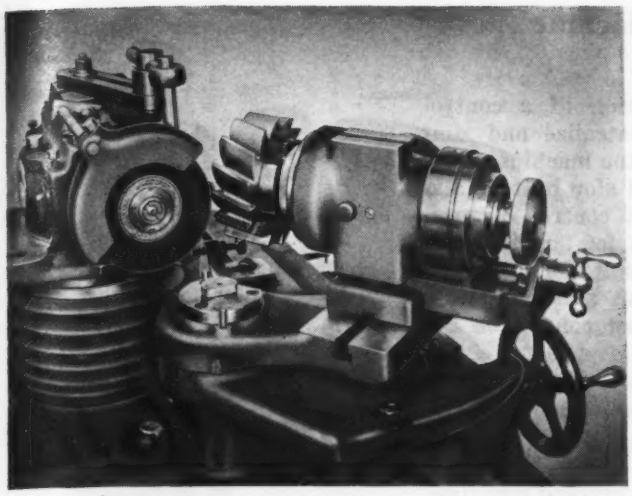


Fig. 1. Cincinnati Grinding Attachment Set up for Grinding a Radius on Teeth of End-mill

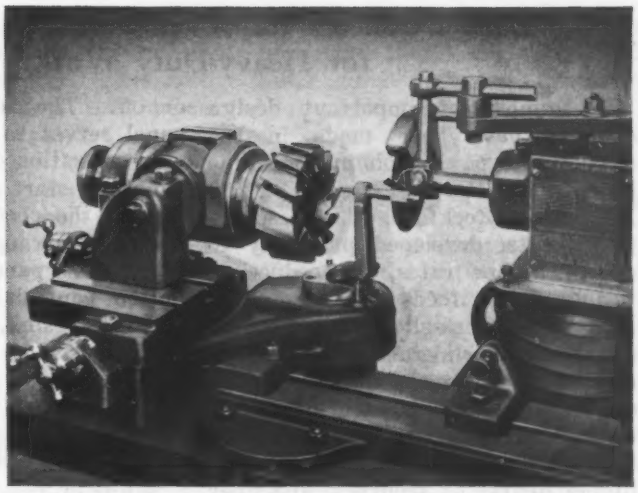


Fig. 2. Micrometer Gage Furnished with Grinding Attachment Illustrated in Fig. 1

sure hose connects the pump with the master cylinder and control valve stylus. There are no complicated mechanisms, levers, or controls to interfere with the operator while the machine is in use.

The profiling equipment can be easily disengaged and a regular cutting tool used to perform ordinary lathe work. The usual stop-collar on the feed-rod will disengage the feed at any predetermined position. The simplicity of the machine, its versatility of operation, ease of control, and quick change-over from profiling to regular lathe work are features that can be used to advantage in practically all types of die and duplication work. 76

Cincinnati Radius Grinding Attachment

A new radius grinding attachment for use on Cincinnati No. 2 cutter and tool grinders has been brought out by the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. This attachment will grind radii of any size up to 1 inch on cutters from 4 to 12 inches in diameter having flute lengths up to 3 inches. Fig. 1 shows the attachment set up for grinding a radius on the teeth of a 6-inch shell type end-mill. Adjustment to the desired radius is easily obtained by means of the micrometer gage shown in Fig. 2, the shank of which is inserted into a tapered hole bored concentric with the swivel point of the attachment. The micrometer gage has a range of 1 inch, and swivels through an angle of 90 degrees to positive stops.

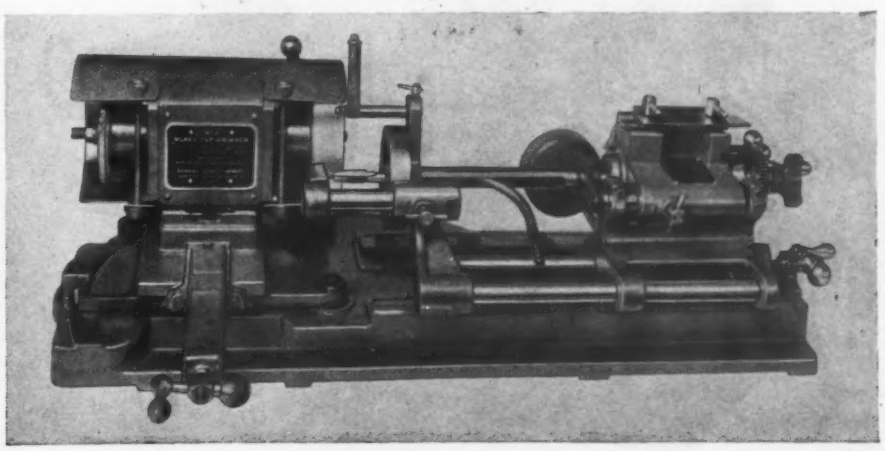
The slides that carry the cutter mounting assembly can be independently operated by a crank and screw arrangement. Micrometer dials graduated to read in thousandths of an inch are fitted to the screws so that the slides can be accurately adjusted. The complete upper part of the unit swivels on a large anti-friction trunnion which is adjustable for wear. Adjustable positive stops limit the swing of this unit to an angle of 90 degrees. 77

Thin-Body Chuck for Blake Tap Grinder

A new type of universal chuck, in which the jaws are actuated by a single pinion-operated three-lobe cam, has been placed on the market by the Edward Blake Co., 634 Commonwealth Ave., Newton Centre 59, Mass. Turning the pinion by means of an Allen wrench serves to rotate the cam which closes the jaws on the work, and a spring acting on each jaw holds the jaw open when the cam is turned in the pressure-relieving direction.

The design of the chuck provides for sufficient pressure on the work to insure a positive grip. As used in the Blake tap grinder, the chuck will hold taps having diameters from 1/16 to 9/16 inch, inclusive. The chuck replaces the large number of collets previously required to accommodate this range of sizes.

The cam chuck was especially developed for use with the bent-shank tapper tap attachment used on the Blake tap grinder. As used with the attachment, the thin body of the chuck serves two purposes—first, it allows the insertion, shank end first, of bent and hooked shank taps; and second, it permits gripping the shank very close to the thread. 78



Tap Grinder Equipped with New Type Universal Chuck Manufactured by the Edward Blake Co.

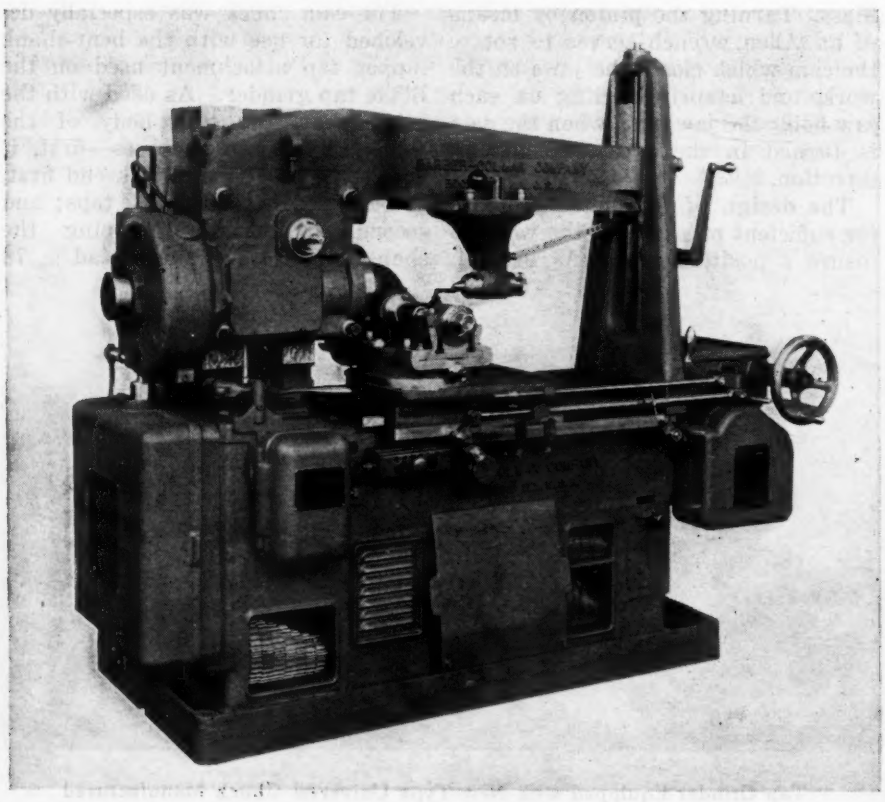
To obtain additional information on equipment described on this page, see lower part of page 240.

Barber-Colman Improved Hobbing Machine for Heavy-Duty Work

A number of important design changes have been made in the standard Type A hobbing machine built by the Barber-Colman Co., 109 Loomis St., Rockford, Ill. These improvements, developed primarily to obtain higher rates of production, include faster feeds and speeds. A heavy-duty work-slide and a heavy-duty hobbing slide are now standard equipment on this machine. All driveshafts and gears are also of heavy-duty design, developed to insure a minimum of torsional deflection, a higher degree of accuracy, and finer finish.

An improved method of mounting the index worm in the worm-gear case includes top and bottom ball bearings, which rigidly support the worm independently of the main index driving shaft. This design permits the drive-shaft to have a floating action, which minimizes eccentricities in the worm and also provides for operation of the machine at higher speeds and feeds with a greater degree of accuracy.

The coolant pump has been simplified in design and is driven by an independent motor. The volume of coolant delivered has been increased and individual push-button control is provided for turning the coolant on or off. The addition of a control panel serves to centralize and simplify operation of the machine. This panel has start and stop buttons and carries the coolant control buttons. Machines arranged for "climb" hobbing have a panel that includes push-button controls for starting, stopping, reversing, and control of the coolant flow. 79



Improved Heavy-duty Hobbing Machine Brought out by Barber-Colman Co.

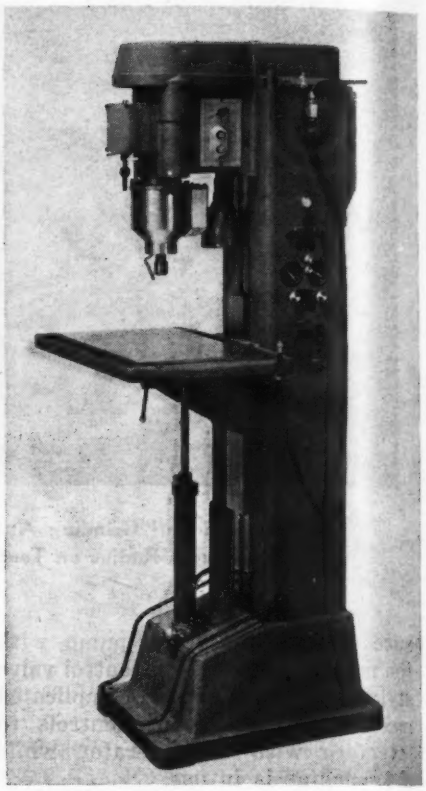
Haskins Tapping Machines

A line of Type U tapping machines of entirely new design with "electric-air" control has been brought out by the R. G. Haskins Co., 617 S. California Ave., Chicago 12, Ill. The "electric-air" control is designed to provide increased sensitivity in the application of power and to obtain extremely accurate control over the depth of the tapping stroke. Microswitch-actuated 24-volt solenoid valves with sensitive pressure control offer the choice of automatic or controlled cycle operation, as well as means for synchronizing the operation of "electric-air" actuated fixtures through the stroke movement of the tapping head.

Any one of three methods of cycle control can be selected by means of panel switches on the side of the machine pedestal. With the switches set for one method of operation, it is simply necessary to insert the work in the fixture to obtain complete automatic control of the downward and return strokes of the tap head. By turning the switches to the second position, the operator can control the cycle manually. With the switches in this position, the tap head can be instantly returned to the top or starting position from any point in its operating stroke by simply releasing the foot-pedal. By setting the switches in the third position, the operator can obtain the advantages of a complete tapping cycle through momentary pressure on the foot-pedal.

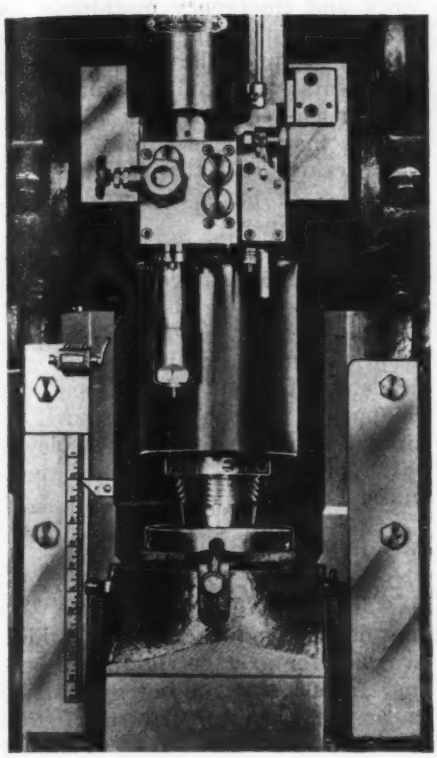
New features of this machine include a frame of improved design; piston and air cylinder incorporating new design principles; easier access to control units for adjustment and replacement; and new automatic and semi-automatic fixtures designed to suit a wide range of work.

These machines are available in three sizes, No. 1-UT having a rated capacity for tapping No. 2 to 3/16-inch threads in mild steel; No. 2-UT having a capacity for tapping No. 6 to 5/16-inch threads; No. 3-UT having a capacity for tapping No. 10 to 3/8-inch N.F. threads. 80



Haskins "Electric-Air" Controlled Tapping Machine

To obtain additional information on equipment described on this page, see lower part of page 240.



Dayton Rogers Overload Pitman for Protecting Punch Press and Dies

Hydraulic Overload Pitman for Punch Presses

To prevent overloading of the average punch press in sizes from 30 tons upward, the Dayton Rogers Mfg. Co., 2835 Twelfth Ave. S., Minneapolis 7, Minn., has brought out a hydraulic overload pitman to replace the standard pitman or connecting-rod. This new hydraulic linkage has been designed to prevent bending of the crankshaft and throwing of other strains on the frame of the press, as well as to protect the dies from being damaged by overloads. The overload safety device is usually set to protect the press at its maximum rated tonnage, but it can also be adjusted to protect any given tool equipment. The overload valve can be adjusted to any desired pressure and sealed to protect it against tampering.

The ram of the press is adjusted in the conventional manner by the ram-adjusting screw. Before the press is started, the pressure in the cushioning chamber is brought up to the desired amount, as indicated on the pressure gage, by means of a hand-actuator. After the press is started, the pressure in the chamber is automatically maintained by a cam-operated pumping mechanism.

In case of overload, the piston simply retreats against the pressure exerted by the high-pressure chamber. The increased pressure causes oil to escape through the overload valve into a reservoir. This action automatically reduces the pressure in the chamber. The required pressure must then be re-established by the hand actuator before the press is ready to resume operation. 81

New Line of Kearney & Trecker Milling Machines

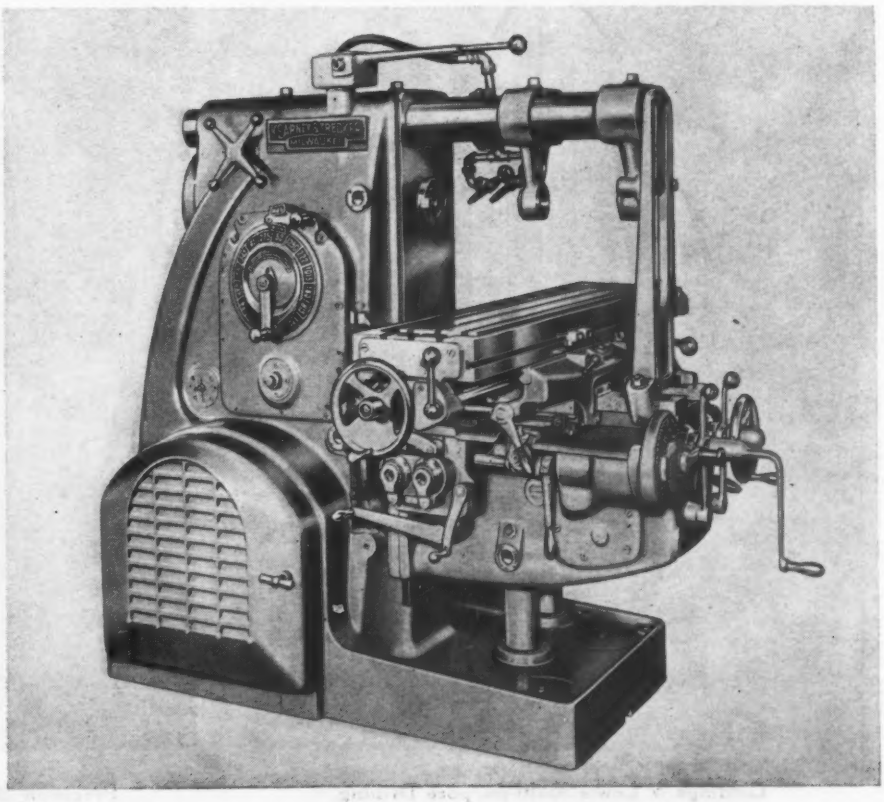
The Kearney & Trecker Corporation, Milwaukee 14, Wis., has announced a CSM line of knee type milling machines, which includes both horizontal and vertical models in 20, 30, and 50 H.P. sizes. The development of this line of machines is said to be the result of intensive experimental and research work in the application of carbide cutters to a variety of milling problems, including the milling of steel. These machines have been designed to meet the basic requirements of increased rigidity, greater driving power, and a more uniform flow of power to the spindle.

The machines have a massive solid-back column, with the spindle-driving motor mounted in the base. Power is transmitted to the spindle through multiple V-belts and the spindle speed selection box. Sixteen quick-change speeds ranging from 50 to 1250 R.P.M. are available in approximate geometrical progression. The spindle is provided with a center bearing to reduce deflection. A heavy flywheel splined to the spindle assures smooth transmission of power to the cutter. The machine table is equipped for "climb" milling.

A feed and rapid-traverse driving motor mounted on the right-hand side of the knee furnishes power for the table feed mechanism. There are thirty-two quick-change feed rates ranging from 3/8 inch to 90 inches per minute which are in approximate geometrical progression. 82

Airco All-Position Mild-Steel Electrode

A new Airco No. 312 all-position, mild-steel electrode has been announced by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. This electrode was designed primarily to prevent "under-bead" cracking in the welding of hardenable steels. Laboratory tests and field applications indicate that the new electrode is satisfactory for welding low alloy, high-tensile steels, particularly in heavy sections where preheating must be employed with



Kearney & Trecker CSM Horizontal Knee Type Milling Machine

To obtain additional information on equipment described on this page, see lower part of page 240.

conventional type electrodes to minimize cracking; free-machining steels which normally have a rather high sulphur content; and cold-rolled steels in which difficulty is encountered because of excessive porosity when conventional type mild-steel electrodes are used. 83

Giddings & Lewis Multiple-Purpose Machine Tool

A multi-purpose portable machine with a swiveling head and column has been designed by the Giddings & Lewis Machine Tool Co., 140 Doty St., Fond du Lac, Wis., to simplify a wide range of unusual drilling, tapping, boring, milling, and facing operations. The column of this machine swivels 360 degrees, and the headstock swivels 45 degrees up and 45 degrees down from the horizontal position.

This machine can be used on work of any size, provided it can be placed in a suitable operating position. It is equipped with a lifting bail to facilitate handling, and can be lowered through an opening as small as 100 inches in diameter. The flexibility of the spindle alignment makes it possible to reach practically any surface in the interior of the work after the machine has once been placed in position.

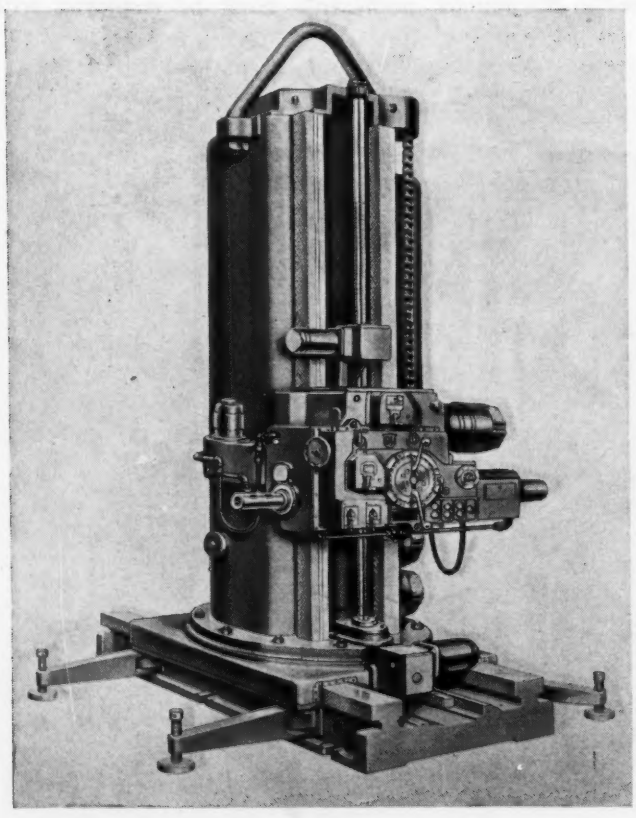
The new machine is particularly useful in cases where the machining of a piece can be better accomplished when it is in the assembled or installed position. It is adapted for many jobs where the piece is too large or of too complicated a shape to permit the required operation to be performed on any of the regular shop equipment. It can also be used for machining angular holes in faces of pieces that cannot be readily set up in the usual horizontal or vertical positions. This machine can also be employed for general utility work and emergency machining operations. Typical applications include the machining of large castings and weldments; internal machining of large open-end work; machining of marine installations within ships or other craft; and the machining of a variety of parts on installed stationary engines.

Scales and verniers for headstock and column travels are provided, and both swivels are graduated to permit accurate setting. Independent operation and setting of the spindle, the headstock on the column, and the column on the runway are possible, since a separate motor is employed to supply power for each of these units. 84

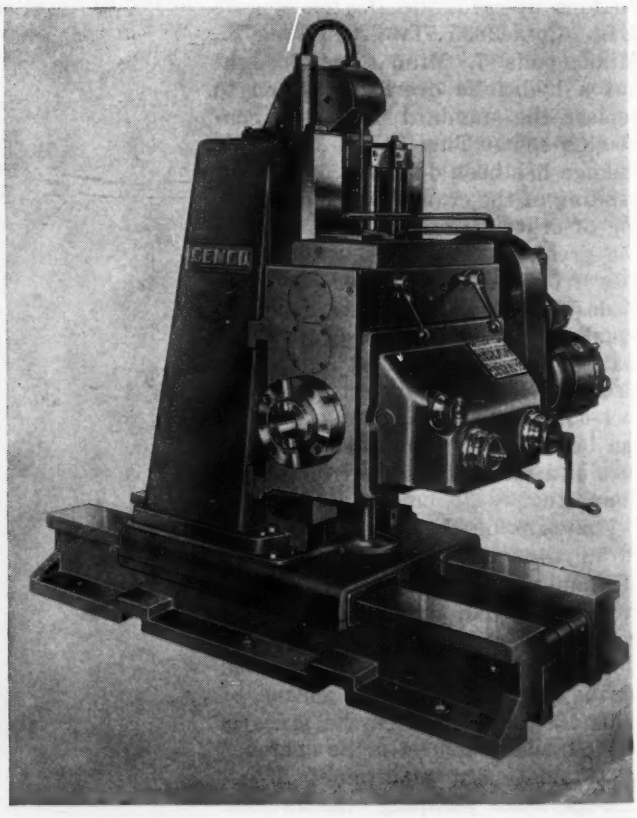
Gemco Boring and Facing Machine

The General Engineering & Mfg. Co., St. Louis 4, Mo., has recently added the boring and facing machine shown in the accompanying illustration to its line of precision machines. This new precision machine can be used in multiple assemblies, and is adapted to a wide variety of boring, facing, back-facing, drilling, and tapping operations on surfaces of heavy, cumbersome work which is impossible or difficult to handle on standard machine tools. The mounting of the spindle housing, which provides for greater rigidity in boring, facing, and milling operations, is an outstanding feature of this machine.

The entire spindle housing, with its spindle nose held in a fixed position in relation to the bearing, can be advanced toward the work. This construction, by avoiding excessive overhang, greatly reduces vibration, increases the permissible feed and depth of cut, and assures machining



Giddings & Lewis Multi-purpose Drilling, Tapping, Boring, and Milling Machine



Precision Boring and Facing Machine Built by General Engineering & Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 240.

to very close limits. The machine can be used either as a stationary unit in a permanent position, in which case the work is brought to the machine, or as a portable unit. A retractable spindle supported by a fixed quill in the spindle housing is available at additional cost for use on work requiring drilling operations.

This machine can also be supplied in modified form and provided with an automatic feed mechanism for performing milling operations. When used for large boring or facing work, a special faceplate with a tool-block slide can be mounted on the head of the work-spindle to obtain the increased capacity required. 85

Die-Casting Machine for Small-Lot Production

A high-speed die-casting machine that costs no more than a band saw or small engine lathe and that uses low-cost prefabricated die sets is being introduced to industry through machine tool dealers by the DCMT Sales Corporation, 401 Broadway, New York 13, N. Y. This machine has been developed for economical production on runs as small as 250 parts.

Prefabricated blank die sets for this machine are available from the machine tool dealers, which permits the manufacturer to make his own dies by simply machining the die cavities and grinding the gates. The DCMT die-casting machine can be set up in two or three minutes, and can be run by an unskilled operator at production speeds as high as 600 "shots" an hour. 86

Cincinnati Bickford "Super Service" Upright Drilling Machine

A direct-driven upright drilling machine designed for mass production drilling, as well as for the handling of small-lot drilling jobs, is built by the Cincinnati Bickford Tool Co., 3225 Forrer St., Cincinnati 9, Ohio. This machine, built in 21-, 24-, and 28-inch sizes, has driving motors ranging from 3 to 10 H.P. Motors having a speed of 1200 R.P.M. are usually supplied, but motors operating at 900 or 1800 R.P.M. can be had to suit the requirements for lower or higher spindle speeds. The motors are equipped with magnetic reversing starters when tapping or spindle-reversing operations are to be performed. Push-buttons for controlling the driving motor are lever-operated and built in as an integral part of the machine.

It is possible to obtain sixteen speeds and eight feeds by rearranging the numbered pick-off gears on lettered shafts according to data on a direct-reading etched plate mounted at the back of the gear-case. An adjustable reversing arrangement for automatic tapping is available for use on high-production work. Tap leads, when supplied, are of the gear-driven type, designed to provide an accurate lead for guiding the tap. A direct-reading graduated scale facilitates drilling to exact depth within 0.005 inch. When precision to within 0.001 inch is required for facing operations, a special "dwell" attachment can be furnished to meet the closer tolerances specified.

The spindle and sleeve are counterbalanced by an easily accessible weight inside the column. When drilling heads are used, they can be easily counterbalanced by employing removable - section counterweights. This machine can be equipped with a cutting lubricant system and with chip hoppers. It is available in two-, three-, or four-spindle gang type construction to meet special requirements. 87

DCMT High-speed Die-casting Machine Designed for Economical Operation

"Super Service" Direct-driven Upright Production Drilling Machine

To obtain additional information on equipment described on this page, see lower part of page 240.

Fig. 1. Cincinnati 6- by 30-inch Precision Center-type Plain Grinding Machine

Cincinnati Precision Center-Type Plain Grinding Machines

A line of four precision center-type plain grinding machines consisting of the 6- and 10-inch machines shown in Figs. 1 and 2, which were built during the war period, and 10- and 14-inch light types (not illustrated) has been announced by Cincinnati Grinders Incorporated, Cincinnati 9, Ohio. The light type machines have all the characteristics of the machines in the sizes immediately preceding them. They are built in the same lengths, but have the extra swing capacity required to accommodate a flange or projecting arm on the work.

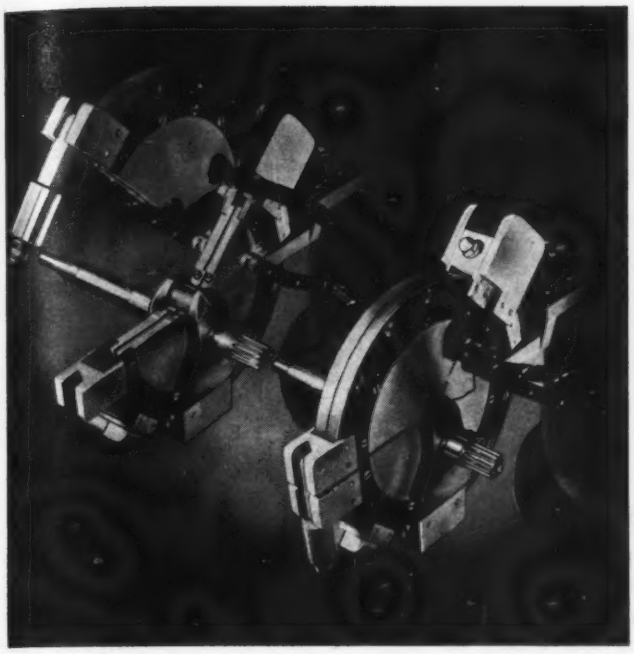
The same features are incorporated in all machines of this line, including wheel-spindles that run on "Filmatic" bearings; filtered oil systems that circulate oil under light pressure to the bearing compartments; tables traversed hydraulically by means of an externally mounted motor-driven pump unit, which obtains oil from a reservoir cast in the machine bed; and knob control, which gives stepless variations of the table traverse rate from 3 to 200 inches per minute. A single lever controls the starting and stopping of table traverse and coolant flow.

The length of the table traverse can be controlled automatically by dogs from a short movement of only 3/32 inch up to the full rated stroke. The dwell at each end of the stroke can be independently adjusted from 0 to 5 seconds by means of knob-controlled throttle valves. The handwheel at the left operates a Servo control, which moves the table at the rate of 1 inch per revolution. The in-feed or cross traverse of the wheel-head is controlled by the large handwheel at the right, which has a large graduated dial that facilitates setting-up operations. The automatic "pick feed," which operates when the table reverses its direction of travel, can be set for one to seven notches on the feed-wheel, which is equivalent to 0.0004 to 0.0028 inch reduction in the work diameter. Hand adjustment for sizing reduces the work diameter 0.0001 inch when the handwheel is moved one graduation.

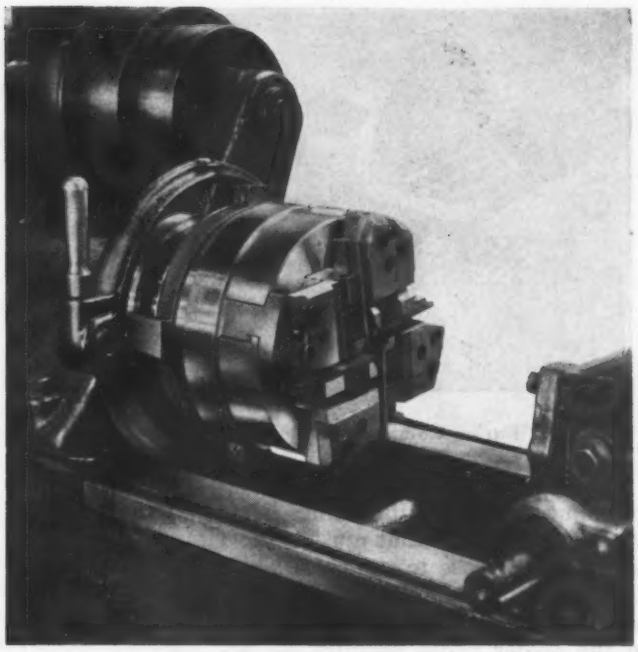
The design of the headstock unit depends on the size of the machine. Headstocks for 6-inch and 10-inch-L machines have 1/2-H.P. alternating-current motors, which provide speeds ranging from about 100 to

Fig. 2. Cincinnati 10-inch Precision Center-type Plain Grinding Machine

To obtain additional information on equipment described on this page, see lower part of page 240.



Thermonic Split Induction Heating Coils Shown in Open and Closed Positions



Lanco Type VV Hardened and Ground Die-heads Made by Landis Machine Co.

400 R.P.M. through a V-belt drive with four-step pulleys. Spindle speeds are changed by means of a built-in rheostat, the speed ratio being approximately 4 to 1 for direct-current equipment and 12 to 1 for variable-voltage equipment.

The larger sized machines have a power rating of 15 H.P. for the wheel-spindle drive motor and 1 1/2 H.P. for the hydraulic motor. The two smaller sizes have ratings of 7 1/2 H.P. for the wheel-spindle motor, and 1 H.P. for the hydraulic motor. The 6-inch and 10-inch-L machines are built in 18- and 30-inch lengths, while the 10-inch and 14-inch-L machines are built in five lengths from 18 to 96 inches. 88

Induction Heating Coil for Localized Hardening

The hardening of localized surfaces of crankshafts, camshafts, and similar parts by induction heating has been greatly simplified by the patented "Thermonic" multi-turn split coil, developed by the Induction Heating Corporation, 389 Lafayette St., New York 3, N. Y. This new coil consists of two or more turns made up of machined copper plates which are split and hinged in such a manner as to allow the coil to be opened, the work inserted, and the coil closed and clamped so that it automatically makes contact between the segmental sections.

The segments of the coil are held in proper relationship to each other by an insulating retainer ring, which runs around the outside of the coil proper and forms a closed passage or chamber between the coil turns which can be utilized to carry the quenching medium to the heated metal without removing the work from the coil. This arrangement eliminates delay between heating and quenching. Since both the coil segments and the supporting leads are water-cooled independently, the coil can be used without internal quenching, thus permitting continuous operation. 89

Bradford "Metal Master" Electrical Tools

The Bradford Machine Tool Co., Electrical Tool Division, Department H, Evans St., Cincinnati 4, Ohio, is now manufacturing a complete line of "Metal Master" electrical tools. Among the features of the new "Metal Master" grinder illustrated are extra heavy-duty motor; oversize ball bearings; semi-steel guards designed to meet the American Standard and Safety Code requirements; push-button station with starter having overload protection and under-voltage release; water pot; tool tray; and spark-breakers.

In addition to the grinder described, the new line includes lathe grinders, automotive equipment, disk sanders, snagging grinders, etc.....90

Lanco Hardened and Ground Die-Heads

The Landis Machine Co., Waynesboro, Pa., has added to its line a new series of Lanco VV hardened and ground die-heads. Previously hardened and ground die-heads of the Lanco type have been available in sizes up to 7/8 inch only. The new VV die-heads are available in 1-, 1 1/2-, 2-, and 2 1/2-inch sizes for use on hand-operated threading machines. These heads are especially

Bradford "Metal Master" Grinder

To obtain additional information on equipment described on this page, see lower part of page 240.

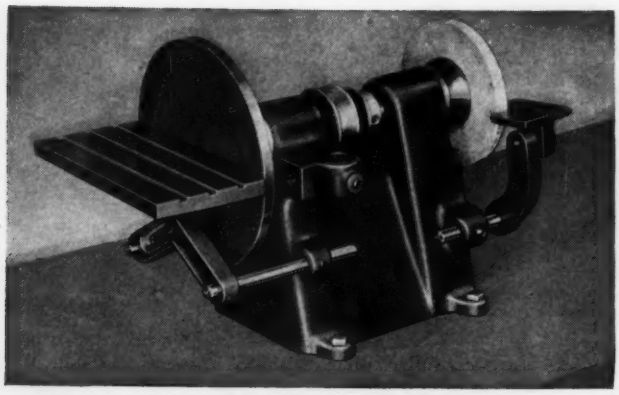


Fig. 1. Parlec Combination Bench Grinder and Sander

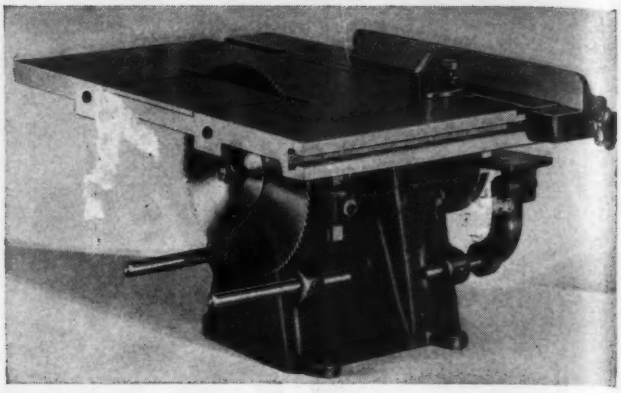


Fig. 2. Machine Shown in Fig. 1 Equipped for Sawing

recommended for threading alloy steel and for work that must be held to extremely close tolerances.

The manner in which the chaser-holders of the die-heads are clamped to the holder slides permits the removal of the holders from the face of the head without disassembling any part of the head or removing it from the spindle. The chaser-holder slides are gibbed to the head body in such a manner as to provide compensation for wear. Zerk type fittings are provided for forcing heavy grease into the chaser slides and other operating parts to prevent the entry of fine cuttings which might cause excessive wear. Extremely fine adjustment for thread size is obtained by a graduated adjusting ring at the rear of the head. 91

Parlec Combination Grinder, Sander, and Circular Saw

A combination bench machine, with an abrasive grinding wheel at one end and a sanding disk with adjustable work-rest at the other, as shown in Fig. 1, is being placed on the market by the Parlec Tool Co., 919 E. Redondo Blvd., Inglewood, Calif. Either the grinding wheel or the sanding disk can be replaced with a buffing or polishing wheel.

The work-rest used with the sanding disk can be quickly detached, the sanding disk replaced by an 8-inch circular saw blade, and a power saw table set in place, as shown in Fig. 2. This saw table can be tilted to an angle of 45 degrees for angular cutting. A calibrated work-guide provides for taking accurate angular cuts, and an adjustable guide at one edge assures accurate parallel cutting. The parallel work-guide slides in a T-slot extending the full width of the table. A 1/3- or a 1/2-H.P. motor is recommended for driving this tool. 92

Gray Traveling-Head Milling Machine

The G. A. Gray Co., Cincinnati, Ohio, has recently introduced a traveling-head type of milling machine with a horizontal spindle which is available with a floor plate, as shown in Fig. 1, or with the column fitted to a saddle having cross-ways perpendicular to the runway, as shown in Fig. 2. The head of this machine is of simple sturdy construction. The spindle, driven by a 50-H.P. adjustable-speed, direct-current motor, runs in double-opposed preloaded precision Timken bearings. The drive to the spindle is transmitted through a sleeve at a point close to the cutter to reduce to a minimum the length of spindle subjected to torsion. Powerful, quick-acting mechanical clamps are provided for clamping the quill, head, and column.

A positioning device facilitates setting the column and head within accuracy limits of 0.00025 inch by simply pressing a micro-jog button on the pendent switch. This switch permits the operator to start or stop the spindle or jog it in either the forward or reverse direction. It also gives him control over the feed and rapid traverse movements of the head and column. Safety devices protect the machine and work in case of faulty operation. Overload protection

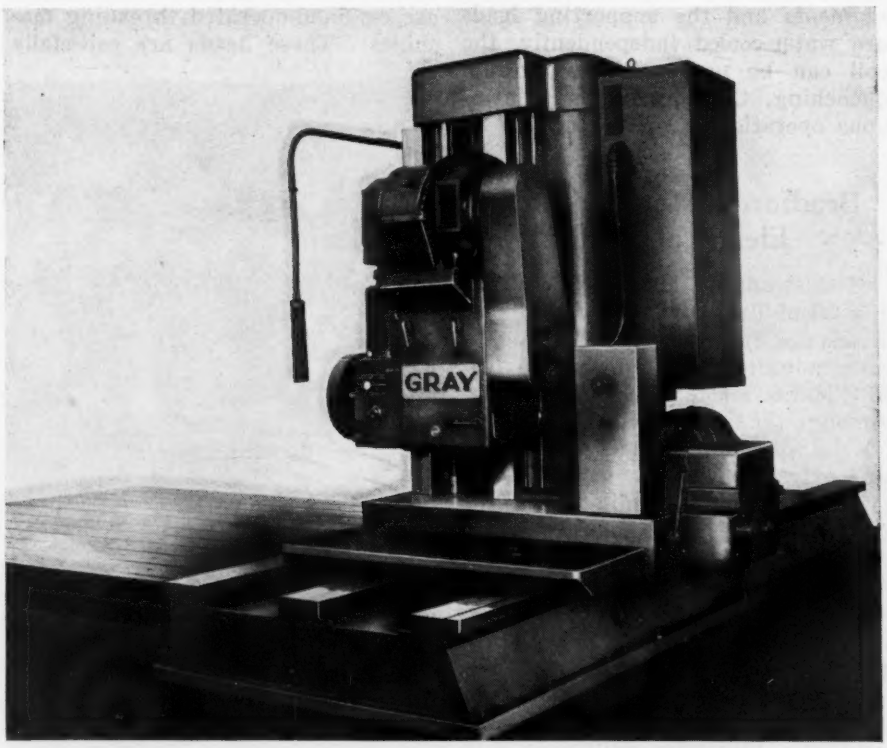


Fig. 1. Gray Traveling-head Milling Machine with Floor Plate

To obtain additional information on equipment described on this page, see lower part of page 240.

for the spindle insures stopping the feed motor before the spindle stops.

The column of the machine shown in Fig. 2 can be moved perpendicularly as well as horizontally along the runway at the feed rate or by power rapid traverse. This portable machine is provided with a lifting bail attached by a double pivoted arrangement which eliminates strain in case the column is not properly placed when the machine is raised. The feed of this machine is driven by an adjustable-speed variable-voltage motor having a rheostat control. The machine shown in Fig. 1 has a feed driven by an adjustable-feed motor with electronic control, and a potentiometer on the pendent switch serves to control the motor speed.

The quills of these machines are 11 inches in diameter and have a travel of 10 inches. The spindle has a No. 60 National Machine Tool Builders standard end. The spindle speed range is from 20 to 300 R.P.M. Vertical travel of the head, travel on the runway, and the size of the floor plate can be made to suit requirements. The feed of the column along the runway, as well as the head feed, is at the rate of 1/2 inch to 60 inches per minute. The width of the runway over the way bearings is 72 inches. 93

Bryant Portable Thread Gage

A portable thread gage designed for fast, accurate inspection of internal threads in parts for which a bench inspection is inconvenient or where the parts are still assembled in a machine is a recent product of the Bryant Chucking Grinder Co., Springfield, Vt. This gage is constructed on the same principle as the Bryant bench model thread gages, but has the added advantage of showing any out-of-round condition of the thread.

Two of the three thread segments are stationary, while the third is attached to a movable arm. By pressing the operating lever the movable segment is retracted, forming a pilot which can be inserted into the work without thread interference. Releasing the operating lever causes the segments to engage all the internal threads, and a partial turn of the gage provides all-over inspection of the threads. At the same time, the over-all accuracy of lead, pitch diameter, thread form, and presence of burrs are indicated. Inspection of different size threads is easily accomplished by changing the gaging segments. The new segments can be quickly lined up by setting them to a master ring gage of the size and accuracy required. 94

Bryant Portable Thread Gage

Pease Printing and Developing Machine

A new dry direct-process 88-R machine designed for the production of whiteprints in cut sheets or rolls, in one continuous operation at a speed of 30 feet per minute, has been brought out by the C. F. Pease Co., Chicago, Ill. With this equipment, the tracings and sensitized papers are simply fed into the ma-

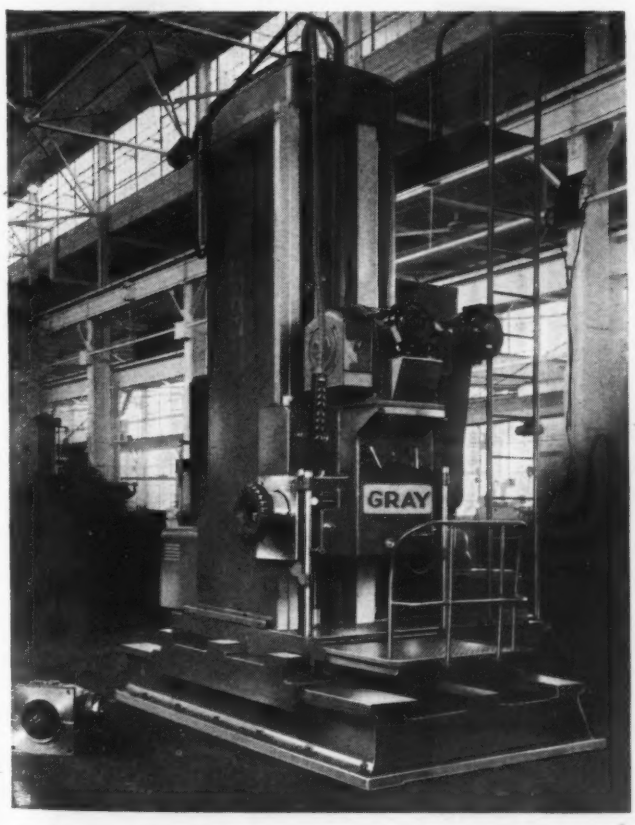


Fig. 2. Gray Traveling-head Milling Machine with Column Fitted to Saddle

Dry-process Printing and Developing Machine Built by C. F. Pease Co.

To obtain additional information on equipment described on this page, see lower part of page 240.

chine, which delivers the finished prints in a matter of seconds.

An outstanding feature of this cylinder type printer is the optional use of revolving or sliding contact. A simple clutch lever enables the operator to change instantly from revolving to sliding-revolving operation in which the cylinder runs slightly faster than the moving tapes. Finished prints can be delivered at either the front or rear, the change from one point of delivery to another being made by a lever at the front of the machine. 95

Monarch Uni-Point Radial Saw

A new light-weight, portable, 12-inch radial saw developed to save time on the average industrial or production wood-cutting job has just been added to the Uni-Point line of machinery made by the American Saw Mill Machinery Co., Hackettstown, N. J. Because of its versatility this saw is said to be adaptable to patternmaking work, a cabinet model, which is now in production, being especially suitable for use in pattern shops or wherever similar permanent installations are desired.

This machine is made principally of light non-rusting magnesium, which permits the complete portable unit, with carrying frame and 1 1/2-H.P. electric motor, weighing approximately 200 pounds, to be readily carried by two men. The machine has a 3- by 16-inch cross cut and 20 1/2-inch wide ripping capacity.

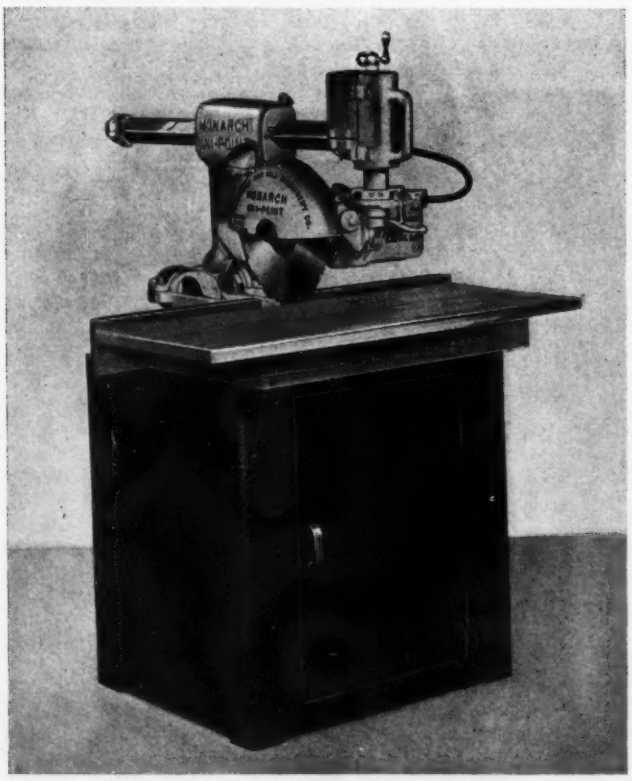
One-point cutting is accomplished by a unique design that permits the entire column of the machine to tilt vertically and also to pivot to the right or left through a horizontal arc, so that regardless of how the machine is adjusted for a bevel, miter, or compound miter cross-cut angle, the saw blade will always travel through the guide fence and cut the work at exactly the same point on the table. 96

"Impact Air Hammer" Units for Riveting and Piercing

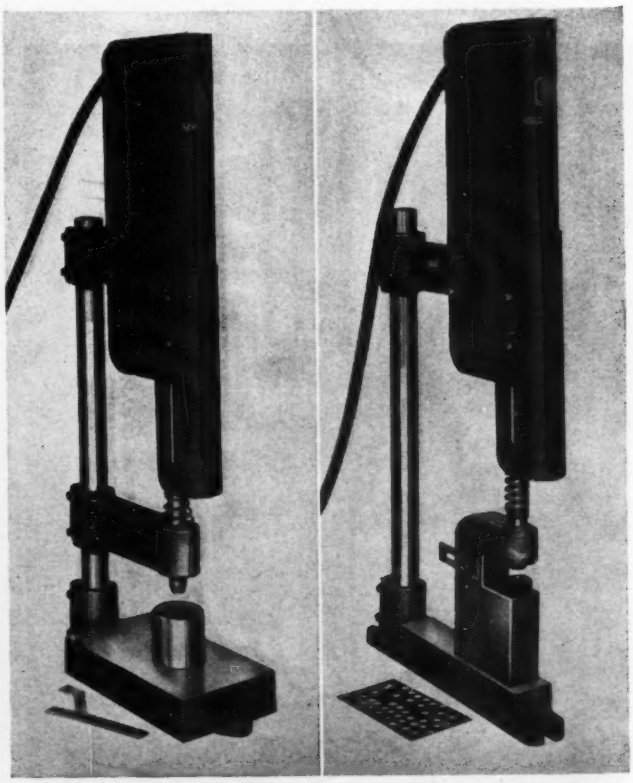
The Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill., has brought out an "Impact Air Hammer" unit which can be equipped with an adjustable tool-holder for upsetting hollow rivets, as shown at the left in the illustration, or can be set up with a Wales-Strippit punch, as shown at the right, for use in multiple piercing operations. With suitable attachments, this impact hammer can be used for many other operations, including blanking out soft material with knife type dies, light coining and forming operations, and stamping letters and figures on plastics, metals, and alloys.

The hammer units are available with bases of three different widths. The narrow base type, weighing only 27 pounds has a base width of only 1 3/4 inches, which permits close grouping of any desired number of units for multiple piercing or riveting applications. The standard type with a base width of 4 1/2 inches is intended for individual set-ups, where a heavy supporting table can be used. The heavy type of hammer, weighing 70 pounds, with a base 10 inches in width is designed for mounting on ordinary light shop benches.

The hammer will upset hollow rivets up to 1/4 inch in diameter, and pierce holes up to 3/8 inch in diameter in 0.065-inch cold-rolled steel when operated at an air pressure of 100 pounds per square inch. The impact force of the ram can be readily adjusted from a maximum of approximately 4000 pounds down to a minimum of only a few ounces..97



Cabinet Model Uni-Point Radial Saw with Saw Assembly which Moves Forward on Wide, Hardened-steel Ball-bearing Rollers in a Smooth, Effortless Glide when Taking a Cut

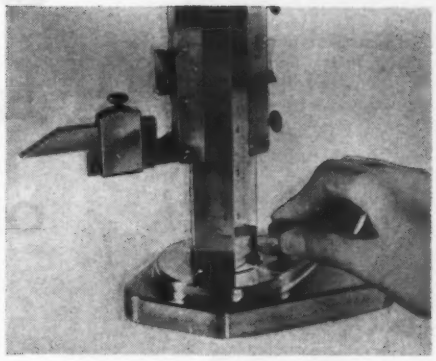


(Left) Mead Air Hammer with Adjustable Tool-holder Arranged for Upsetting Hollow Rivets. (Right) Mead Air Hammer with Wales-Strippit Punch Used in Multiple Piercing Operations

To obtain additional information on equipment described on this page, see lower part of page 240.

Chesterman Large-Sized Height Gage

The George Scherr Co., Inc., 199 Lafayette St., New York 12, N. Y., has announced a new 48-inch Chesterman height gage, designed for the precision inspection, lay-out, scribing, and checking of large-sized jigs, fixtures, dies, and castings. This gage has an extra large vernier scale measuring 2.450 inches in length, compared with the 5/8-inch vernier scale commonly found on height gages. Thus, the verniers that read to 0.001 inch on the English scale and to 1/50 of a millimeter on the metric scale can be read without removing the gage from the work for inspection with a magnifier. 98



Chesterman Height Gage for Use on Large Work

Flash Freeze Unit for Industrial Cold-Treatment

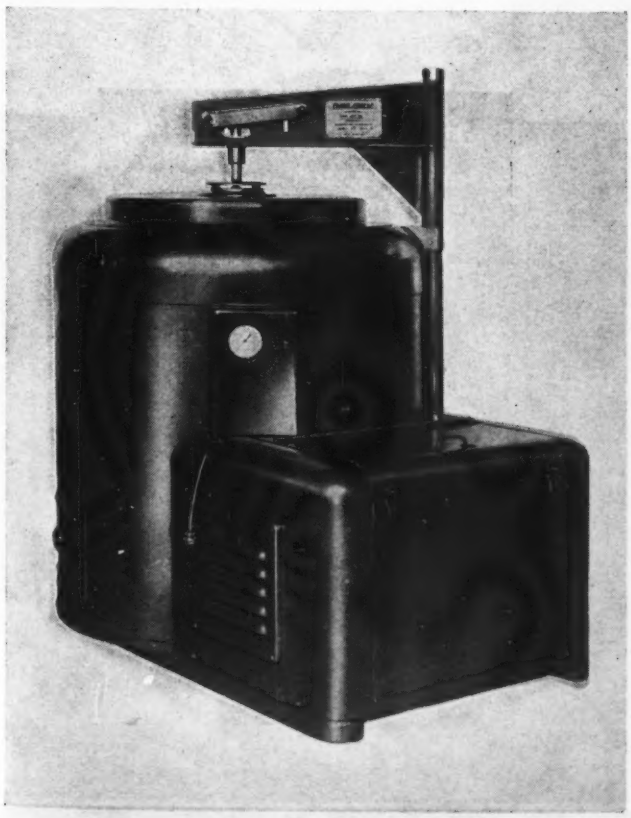
Super-Treat, Inc., Department C, 3412 Beekman St., Cincinnati 23, Ohio, has announced a radical new development for the application of industrial cold-treatment to metal parts, known as "Flash Freeze." The "Flash-Freeze" unit can be cooled from room temperature to —130 degrees F. in approximately two hours. This extremely low temperature can be obtained repeatedly with a high degree of accuracy. The special design of this "Flash Freeze" unit enables the manufacturer to guarantee that temperatures of —130 degrees F. or lower can be maintained.

The unit can be shut down for a day, week, or month and be made ready for instant use without complicated adjustment by simply adding dry ice to the heat transfer medium, swinging the lid into position, and pressing the starter button. The unit can be furnished with either standard or special work baskets. It is recommended for all cold-treating operations, such as shrink fits, gage stabilization, and treatment of tools, including power saw blades, milling cutters, drills, reamers, dies, etc. 99

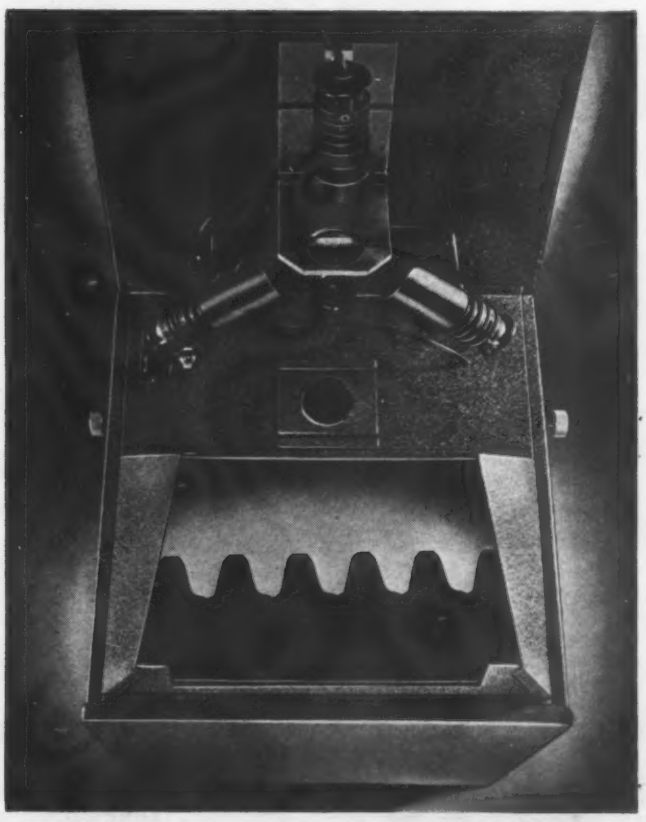
Optical Contour Comparator

The Fish-Schurman optical contour comparator developed for the quick, accurate comparison or examination of screw threads, dies, gears, instrument parts, and profiles of a wide variety of precision work is being placed on the market by the Sheffield Corporation, Dayton 1, Ohio, who recently acquired the exclusive selling rights for this equipment. The comparator is suitable for the production inspection of parts not easily checked with conventional gages. When equipped with an attachment, it can be employed for the inspection of opaque objects and fine assemblies of exceedingly small parts, revealing surface flaws and defects, as well as inaccuracies of profiles.

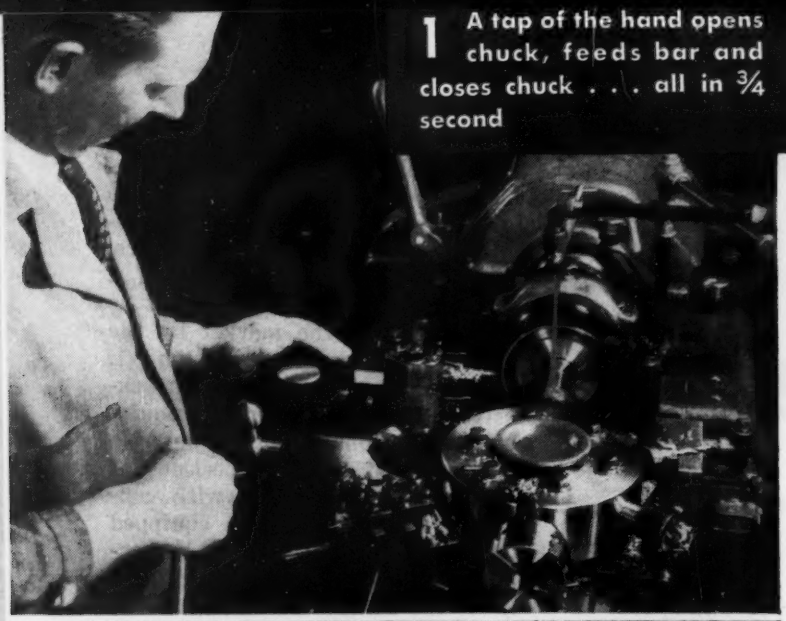
The standard model comparator has a 25 to 1 amplification, but 13 to 1 and 50 to 1 or other special amplification optical systems are available. The enlarged image of the part being checked appears on a glass screen having a mat surface 9 by 14 inches. A single adjustment brings the image into sharp focus for comparison with a sketch or drawing of the "standard" made to the same scale of magnification on a tracing sheet. If desired, the outline of the standard can be drawn directly on the screen. 100



"Flash Freeze" Unit Made by Super-Treat, Inc.



Fish-Schurman Optical Contour Comparator



1 A tap of the hand opens chuck, feeds bar and closes chuck . . . all in ¾ second

SO SIMPLE

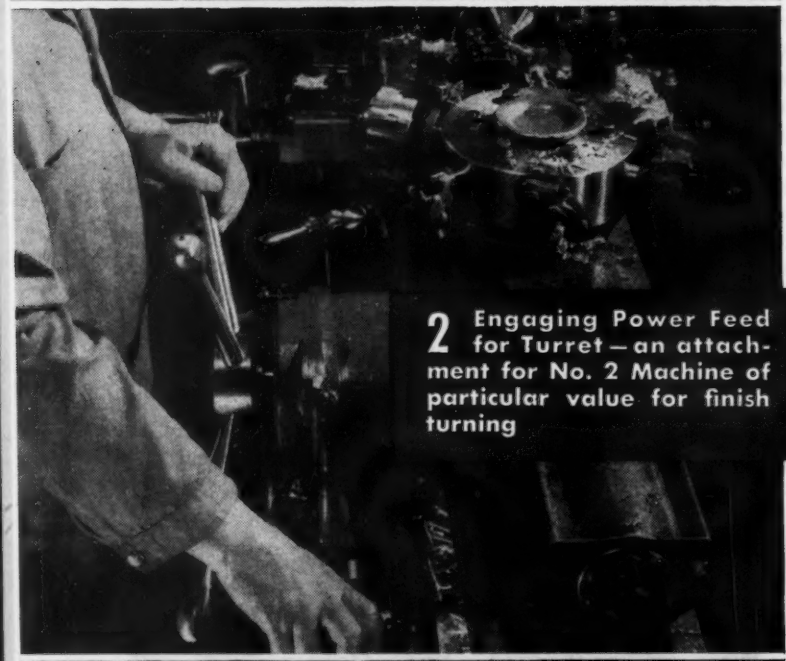
—Just run through a cyc

on these *handy*... W

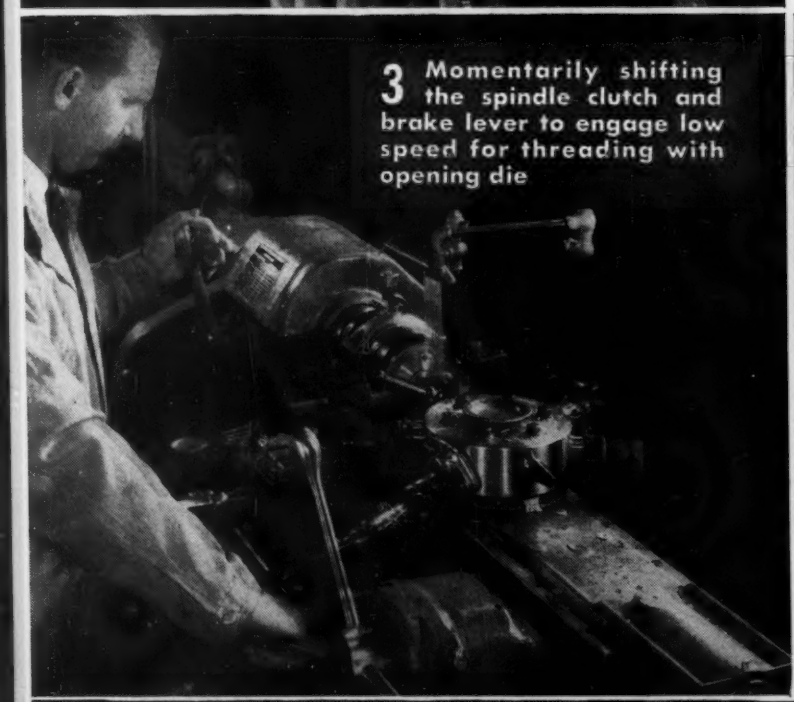
SC

You'll appreciate their operating ease with minimum number of controls—so profitable on short runs

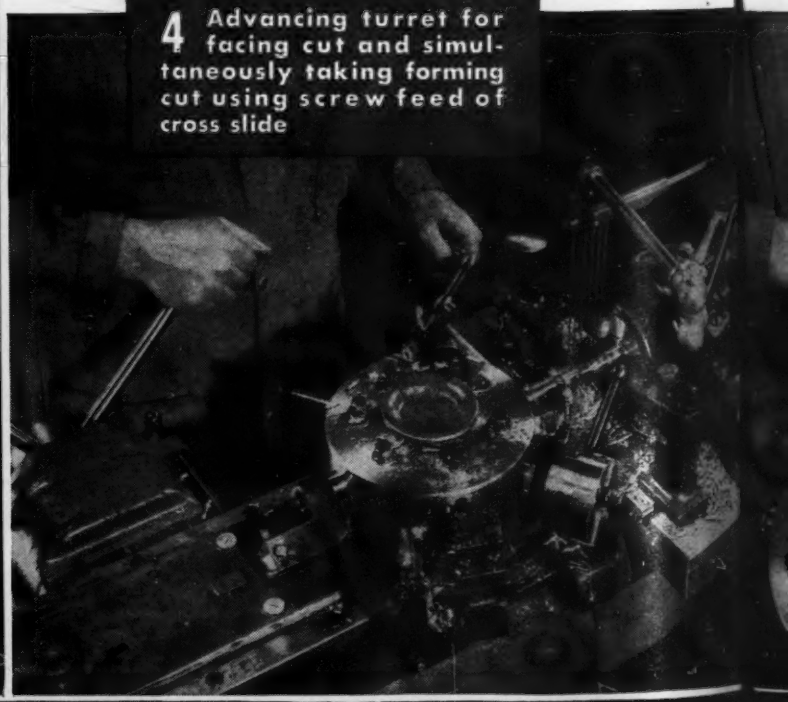
Full facilities for completing pieces from bar stock



2 Engaging Power Feed for Turret—an attachment for No. 2 Machine of particular value for finish turning



3 Momentarily shifting the spindle clutch and brake lever to engage low speed for threading with opening die



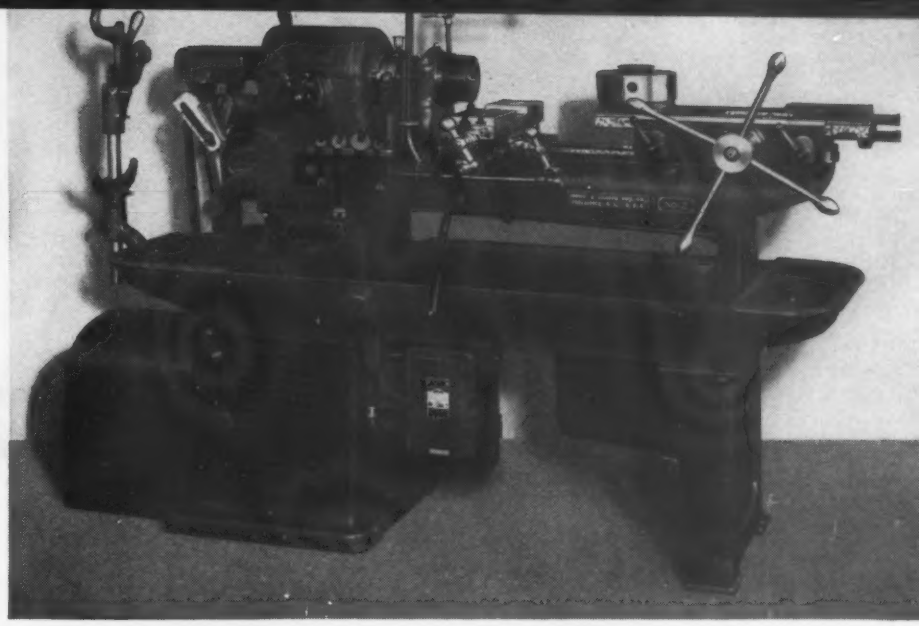
4 Advancing turret for facing cut and simultaneously taking forming cut using screw feed of cross slide

BROWN &

AND FAST!

a cycle of operations

WIRE FEED SCREW MACHINES



One lever controls spindle—forward, backward and brake

Cross slide has lever feed for quick action. No. 2 Machine also has screw feed

20 spindle speeds—efficient high speeds in proper relation to slow threading speeds—ranging from 3620 to 175 r.p.m. on No. 1 Machine and 2485 to 125 r.p.m. on No. 2

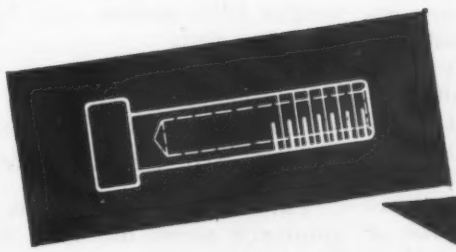
Adjustable stop for each turret tool

★ No. 1 Machine takes stock to ⅝" dia. (⅞" for light work).

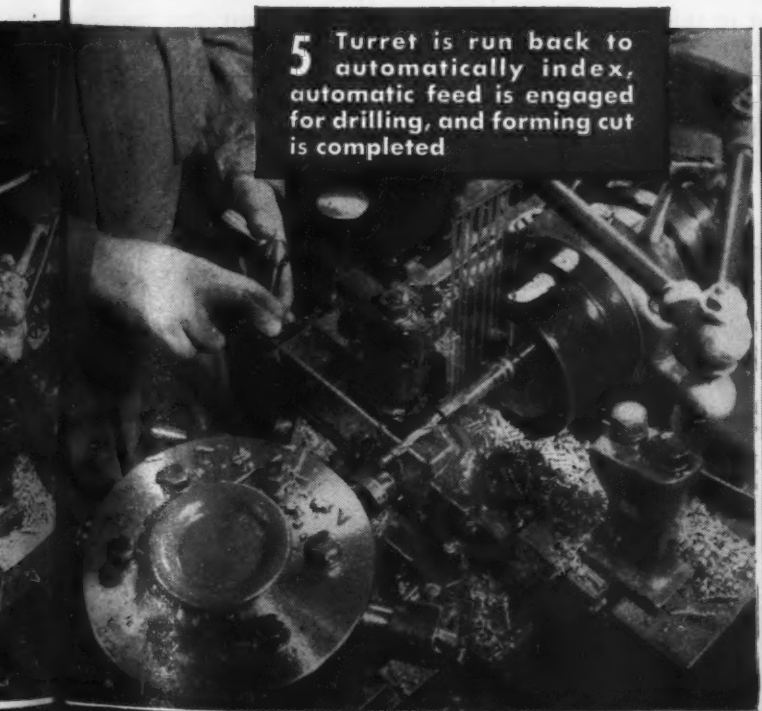
★ No. 2 Machine (shown) takes stock to 1" dia. (1¼" for light work).

Ask for Booklet giving details

B·S BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.



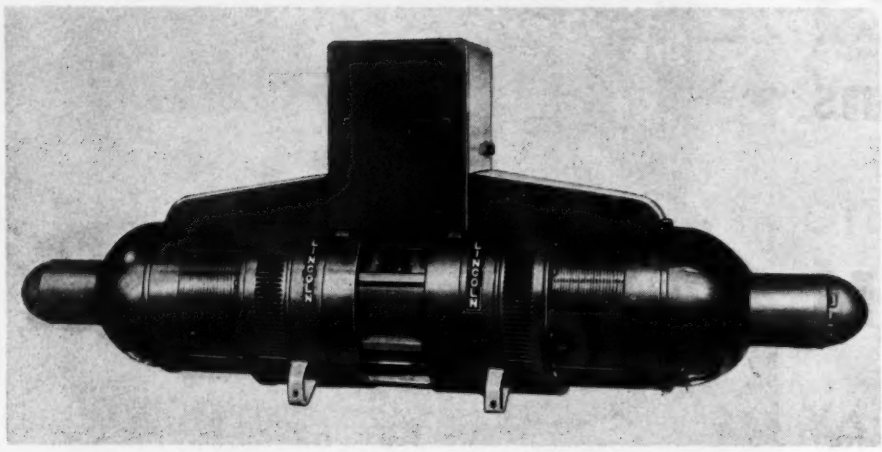
. . . and the machine is quickly set up to perform **second operations** at the same high productive capacity



5 Turret is run back to automatically index, automatic feed is engaged for drilling, and forming cut is completed

6 Completed piece is now cut off by the tool on the rear cross slide

SHARPE



Lincoln 1200-ampere Welder

"Lincolnweld" Process Welder

A new welder of 1200 amperes capacity, comprising two 600-ampere generators close-coupled to an alternating-current induction motor and equipped with complete motor control, has been developed by the Lincoln Electric Co., Cleveland 1, Ohio, for use with this company's recently introduced "Lincolnweld" process of automatic metallic shielded-arc welding. The unit is of arc-welded steel construction, and is completely wired, ready for connection to the alternating-current power source and to the "Lincolnweld" head of the stationary, self-propelled carriage or tractor type equipment, the motor connections being arranged for 220, 440, or 550 volts, three- or two-phase, 60 or 50 cycle lines.

The output on either single or parallel operation is varied by a rheostat on the automatic control panel. This provides for adjustment of the output in minute steps from maximum to about 40 per cent of maximum on parallel operation, and about half this output on single generator operation. A magnetic starter in combination with a protective control device provides complete positive overload, no-voltage and undervoltage protection. The alternating-current motor is protected by a special device operated by both temperature and electric current. The welder weighs 3200 pounds, and has four mounting feet. 101

Tavannes Single-Spindle Automatic Screw Machines

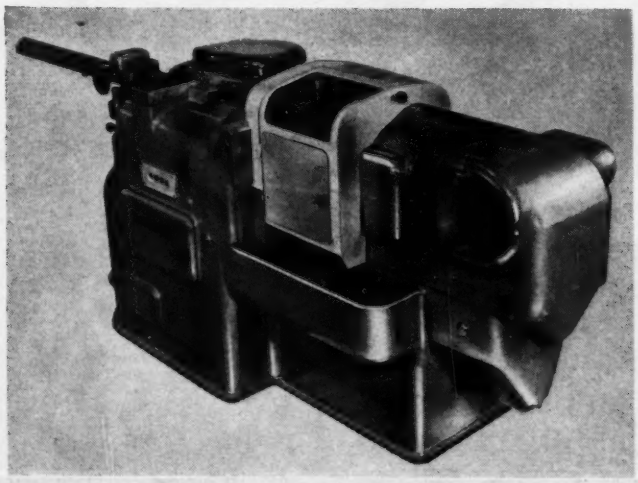
Tavannes single-spindle Swiss automatic screw machines designed for the effective use of carbide tools in all working positions are being placed on the market in this country by Commentry Industries, Inc., 260 West Broadway, New York 13, N. Y. These machines are built in two capacities—the M-40 machine, which takes bars up to 1 5/8 inches in diameter; and the M-60 machine, which handles bar stock 2 3/8 inches in diameter. The maximum turning length with standard tooling is 7 1/8 inches, and a special tooling arrangement permits the handling of work up to 9 inches long. Work up to 18 inches long can be turned, however, by recoiling the headstock unit twice for the stock-feeding operation. The working positions of these machines are divided into six stations for side slide operations and six turret positions. Each of the six turret tools can be rotated independently of the others.

Chucking work up to 4 inches in diameter can be accommodated when the automatics are arranged to handle castings, forgings, and cut lengths of stock. Both adjustable split dies and self-opening die-heads can be used for threading operations. The maximum length stroke for the side slides is 1 3/16 inches for both machine capacities.

There are fifty-one spindle speeds available, the minimum speed for the M-40 machine being 90 R.P.M., and for the M-60 automatic 64 R.P.M. The maximum spindle speed for the M-40 machine is 2308 R.P.M., and for the M-60 screw machine 1523 R.P.M. A 4-H.P. motor is used in the M-40 automatic, and a 4- to 6-H.P. motor in the M-60. Each machine weighs approximately 5500 pounds. 102

DoAll Surface Plate

A surface plate of improved design has been announced by the DoAll Co., (Gage Division), 1301 Washington Ave. S., Minneapolis 4, Minn., which conforms to or exceeds the proposed commercial standards for laboratory class cast-iron surface plates recently submitted to industry

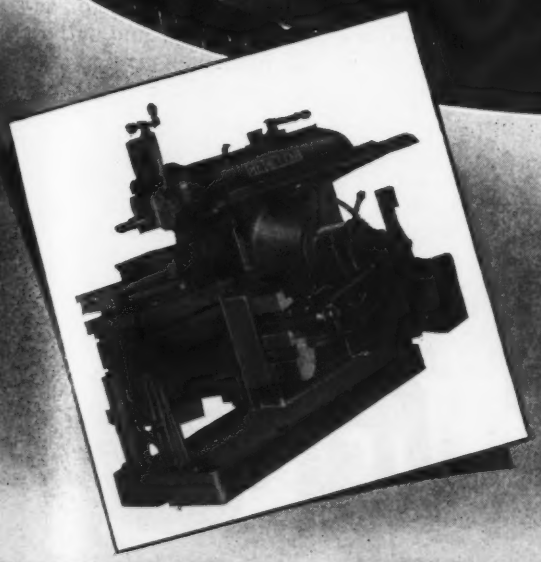


Tavannes Single-spindle Automatic Screw Machine

DoAll Surface Plate of Improved Design

To obtain additional information on equipment described on this page, see lower part of page 240.

THEY ARE dependable-



They never stop—fair weather or foul—day and night the iron horse rolls, delivering the goods of a nation—they are dependable.

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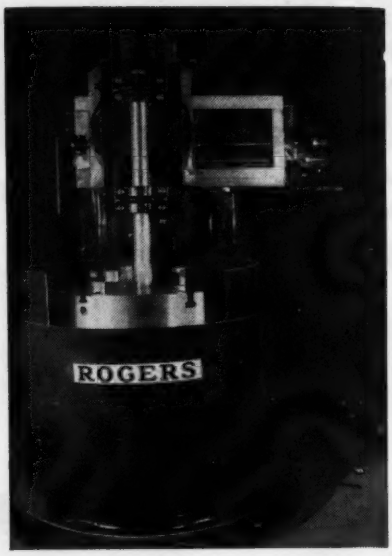
by the National Bureau of Standards. The 14- by 24-inch working area of the plate is made of a specially alloyed close-grained iron. It is supported by three feet, which are so positioned that they reduce sagging to a minimum. The working surface is pin-point hand-scraped.

The 3/4-inch overhanging edge is machined all around. Thus work or fixtures can be easily and firmly clamped to the surface plate. The edge of the working surface is drilled and tapped on 2-inch centers all around to facilitate mounting fixtures. The surface plate comes with removable handles and a plywood cover having a heavy oil-saturated felt lining that protects the plate from rusting. 103

Woodworth Adjustable Thread Ring Gage

A new type of adjustable thread ring gage designed to provide greater accuracy and longer life is being introduced to industry by the N. A. Woodworth Co., 1300 E. Nine Mile Road, Detroit 20, Mich. This gage is designed to distribute the wear over the full thread area, so that roundness and maximum range of adjustment are maintained and the useful life of the gage increased from two and one-half to five times.

The aluminum-alloy outer body of the gage serves to reduce operator fatigue by cutting the weight of the gage in half. A higher degree of accuracy and greater sensitivity are said to result from this reduction in weight. The "Go" gages are identified by green bodies, and the "No-Go" gages by red bodies. 104



Rogers Vertical Boring Mill

Vertical Turret Mill Equipped for Special Boring Operation

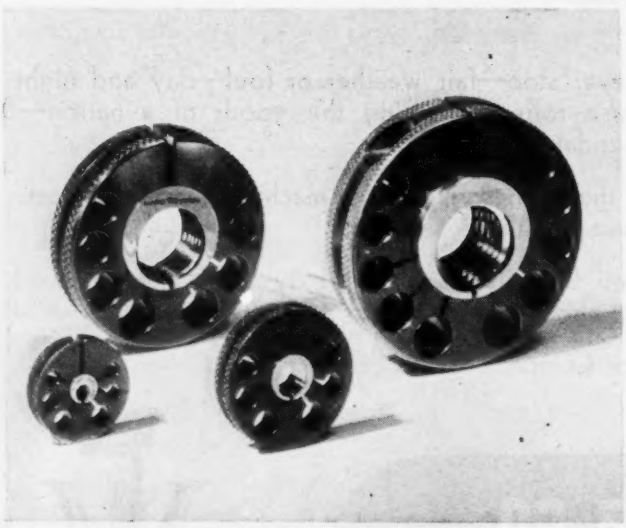
The Rogers Machine Works, Inc., 1807 Elmwood Ave., Buffalo 7, N. Y., have announced that the standard Rogers "Perfect 36" vertical turret mill, which is regularly equipped with an adjustable five-position main vertical turret, swivel side-head, horizontal four-jaw chuck, over-size spindle, motor-driven rapid traverse, and foot controls, has been adapted for special boring operations that present unusually difficult problems. The machine as modified and equipped for this work has an extra heavy boring-bar and a three-jaw combination chuck designed for single-operation work. These machines are built in both standard and high-speed models. Self-contained coolant systems are available. 105

Hanna Air and Hydraulic Control Valves

The Hanna Engineering Works, 1765 Elston Ave., Chicago 22, Ill., have brought out three simply constructed valves for air and hydraulic systems which are the first of a new line developed to obtain more efficient control with a minimum of operating effort. The Hanna "Unitite, Jr.", packless 1/4-inch capacity valve, shown to the right in the illustration, is designed for tubing and light piping applications. This valve is precision built for four-way operation, but can be used as a three-way valve by closing one port. It is suitable for air, oil, or water systems operating at pressures up to 250 pounds per square inch. This valve is available for manifold, column, or panel mounting.

The foot-operated valve shown in the lower left-hand view is a packless type designed for operation in air and oil-hydraulic cylinder applications. This valve frees the operator's hands for manipulating the work, and is made in two styles—one with a single pedal for constant-cycle operation, and the other with a split pedal which holds its position until tripped for reversal. This valve is available in 3/8-, 1/2-, 3/4-, and 1-inch sizes for operation in 250 pounds per square inch air pressure, or 1000 pounds per square inch oil-pressure systems.

Control of cylinder piston speed in both directions is accomplished by the two-direction speed control valve shown at the upper left of the illustration. This valve provides for adjustable control of inflow and outflow of air or oil independently to and



Adjustable Thread Ring Gage Brought out by the N. A. Woodworth Co.

Air and Hydraulic Control Valves Made by Hanna Engineering Works

To obtain additional information on equipment described on this page, see lower part of page 240.

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New METAL DRILLING MACHINES

These Super Service Upright Drills meet the fundamental requirements of high production. They are speedy, safe, simple, and rugged. You get more holes per dollar. Easy, accessible controls, sizes and capacities to your need—to your profit.

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RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit
Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

from one side of the piston. Working pressures are 250 pounds per square inch for air cylinders and 1000 pounds per square inch for hydraulic systems. This valve is available in the same pipe sizes as the foot-operated valve. 106

Empire Live Centers with Interchangeable Points

A line of live centers equipped with combination ball bearings designed to absorb radial and thrust loads has been brought out by Royal

Empire Live-center Set Designed for Tool-room Use

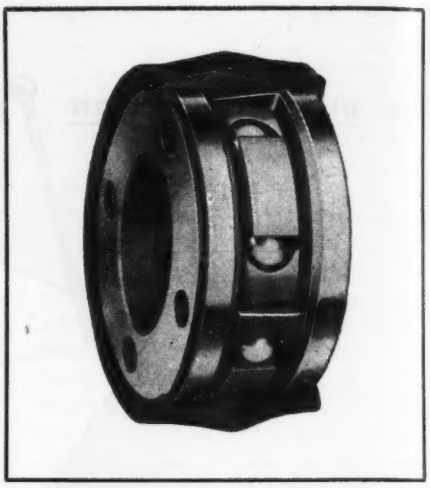
Products, 68 Spring St., New York 12, N. Y. These centers are designed for use in lathes, screw machines, turret lathes, cylindrical grinders, thread grinders, milling machines, and thread millers. They have interchangeable points adapted for various operations, a tapered seat which serves to maintain precision alignment, and a very short overhang which tends to eliminate chatter. The heavy-duty bearings are preloaded to carry heavy loads. The points are of hardened and ground tool steel, and the case is also hardened and ground.

These live centers are available with Morse taper shanks ranging from No. 1 up to No. 6. They are also furnished in a variety of Morse-Hendey, Jarno, and Brown & Sharpe taper shanks, as well as straight shanks. The toolmaker's set illustrated consists of an Empire live center with a complete set of interchangeable points ground while mounted on the center. This set includes a wooden case with a compartment for each tool. It is available in a variety of sizes. 107

Cemented-Carbide Reversible-Wire Plug Gages and Thread-Measuring Wires

A line of reversible-wire type plug gages of cemented carbide has been brought out by the Lincoln Park Industries, 1719 Ferris Ave., Lincoln Park 25, Mich. These gages are manufactured in a size range from 0.025 to 0.375 inch, and are made to Class XX and X tolerances. The members are easily adjusted for length by loosening nuts in the ends of the handle, and can be cut off when worn or reversed in the handle as required. Two styles of metal handles, both of the collet type construction, are provided—a flexible handle for sizes up to 3/16 inch, and a rigid light-weight handle for the larger sizes.

A complete line of thread and gear measuring wires of Carboloy cemented carbide is also being made by this company. These wires are ground and lapped to closer tolerances than National Bureau of Standards specifications. The wires are supplied in sets of three. Wires for N.S.4 to 36 pitch are available from stock, and wires for other pitches are made to order. 108



"Ballflex" Flexible Coupling

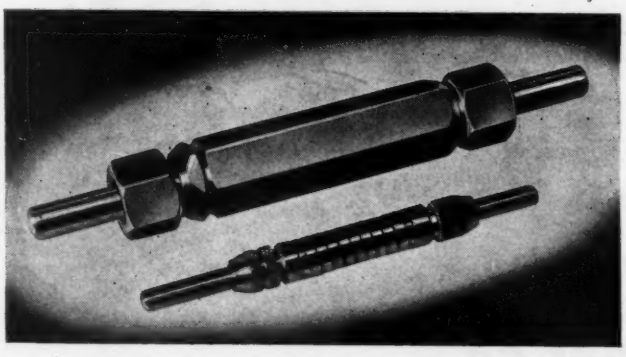
Ballflex Flexible Couplings

A new angular and axial flexible coupling known as the "Ballflex" has been brought out by the Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich., which obtains its flexibility by mechanical means only. Friction is reduced to the minimum in these couplings by the use of hardened and ground steel balls through which all torque is transmitted. Free rolling movement in any direction eliminates side thrust and the bending or springing of parts, both in the coupling and the bearing.

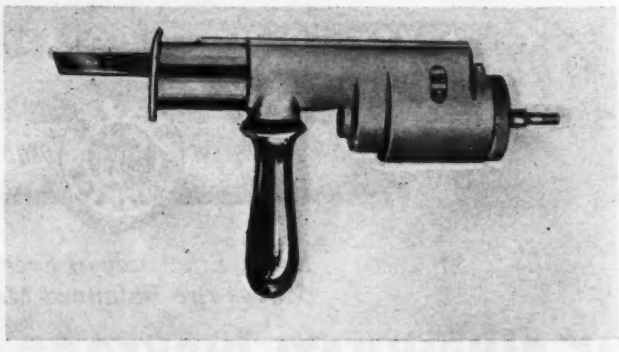
The coupling permits parallel misalignment up to 1/8 inch and angularity up to 3 degrees. Installation consists simply of inserting the coupling between the flanges on the two shafts and fastening it to the flanges with bolts. No lubrication is required, as the coupling is packed with sufficient lubricant at the factory. 109

Wyco Hy-Speed Saw

The "Wyco Hy-Speed" saw here illustrated was developed by Wyzenbeek & Staff, Inc., 838 W. Hubbard



Lincoln Park Cemented-carbide Plug Gages



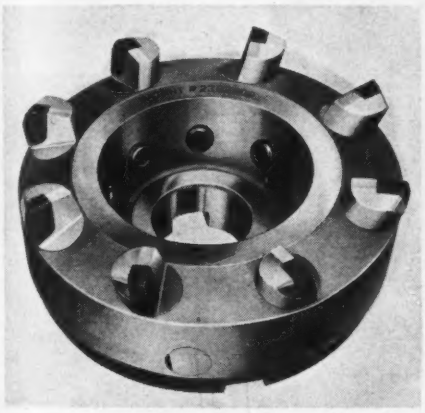
"Wyco Hy-Speed" Saw Brought out by Wyzenbeek & Staff

To obtain additional information on equipment described on this page, see lower part of page 240.

St., Chicago 22, Ill., for fast, dependable operation. It can be attached to any 1/4-inch electric drill, air drill, or flexible-shaft drive. It will saw and file metals, wood, and plastics. The driving shank of the saw can be held in a drill chuck or collet. Ordinary hacksaw blades and standard 1/4-inch shank machine files can be used in this tool. 110

"Vibra-Cushioned" Carbide Cutters for Face-Milling Steels

An entirely new line of "Vibra-Cushioned" face-milling cutters with carbide-tipped inserted blades has



Carbide-tipped Inserted-blade Face-milling Cutter

been introduced on the market by the Tungsten Carbide Tool Co., 2661 Joy Road, Detroit 6, Mich. These cutters combine the advantages of both inserted-blade and fixed-blade type cutters for milling steel. One of their outstanding characteristics is their ability to resist vibration, which is the most destructive element to carbides in the machining of steels.

The blades employed are wedge-locked into the cutter body, which, in addition to being slightly heavier than conventional milling cutters, has the weight distributed so as to provide the maximum "flywheel" effect needed for smooth cutting action.

The new cutter line is produced for use on spindles with National standard drive ends, in four sizes —6, 8, 10, and 12 inches outside diameter—and in both left- and right-hand types. Blades are designed specifically for each size. Both the blades and cutter bodies are carried in stock. 111

Electrolimit Continuous Gaging Equipment

To meet rolling mill requirements for a continuous "flying mike" which will reach in farther on the rolled strip material than standard gages, Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn., has brought out the Model D-10 Electrolimit continuous gage shown in Fig. 1, which has a throat depth of 10 inches and is accurate to 0.000025 inch under constant temperature conditions. It differs from the Model D only in the depth of the throat and the main casting.

The temperature compensator for P&W Electrolimit continuous gages (Fig. 2) provides continuous accurate gaging of strip material while it is being rolled on a cold reduction mill. It is designed to maintain zero setting for all conditions of temperature, so that the gage indication will be accurate for any setting thickness, whether the gage is cold or warm. This compensator can be readily applied to any P&W Electrolimit gage in about ten minutes. The only mechanical change required on

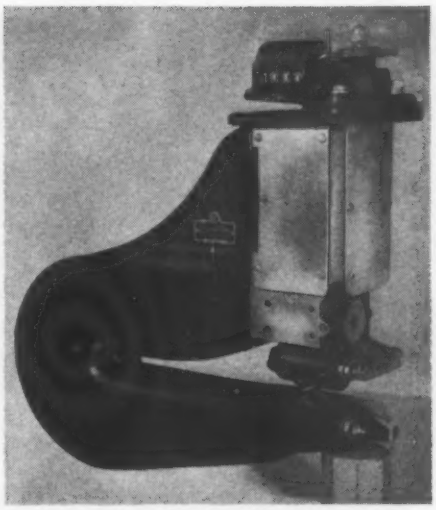


Fig. 1. P&W Electrolimit Deep-throat Continuous Gage for Rolled Strip Material

the gage is the replacement of the lower roll stud with the temperature compensator stud.

The P&W Electrolimit continuous gage remote control unit shown in Fig. 3 was developed for use with the continuous Electrolimit gage when it is desirable to set the gage from some remote position. The handwheel setting knob on the gage head is replaced by a reversing Selsyn motor and worm-gear drive. The counter which indicates the gage setting on the head thus remains undisturbed. The various members comprising this installation, as shown in the illustration, are: (1) Model D continuous gage head; (2) gage-head counter; (3) gage-head Selsyn motor; (4) cross-head; (5) cross-slide; (6) rail; (7) sprocket for overhead slide control; (8) remote control cabinet; (9) indicating meter; (10) cabinet counter; and (11) plus and minus toggle switch. 112

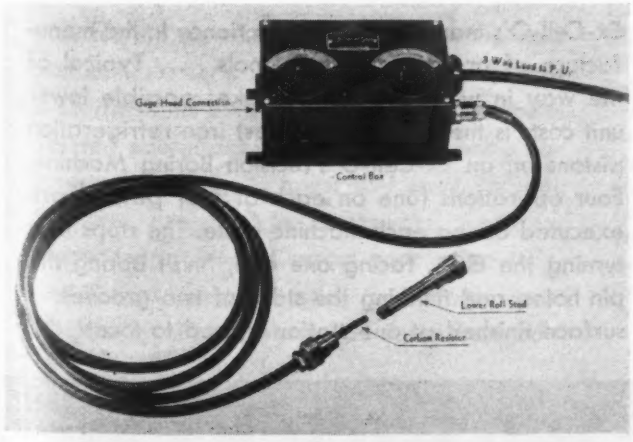


Fig. 2. Temperature Compensator for P&W Electrolimit Continuous Gage

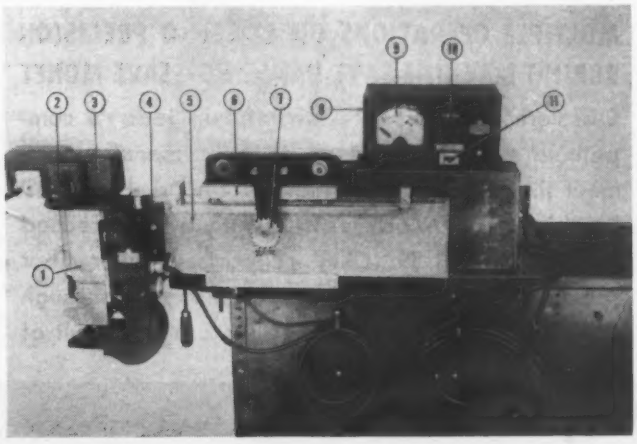


Fig. 3. Remote Control Unit for P&W Electrolimit Continuous Gage

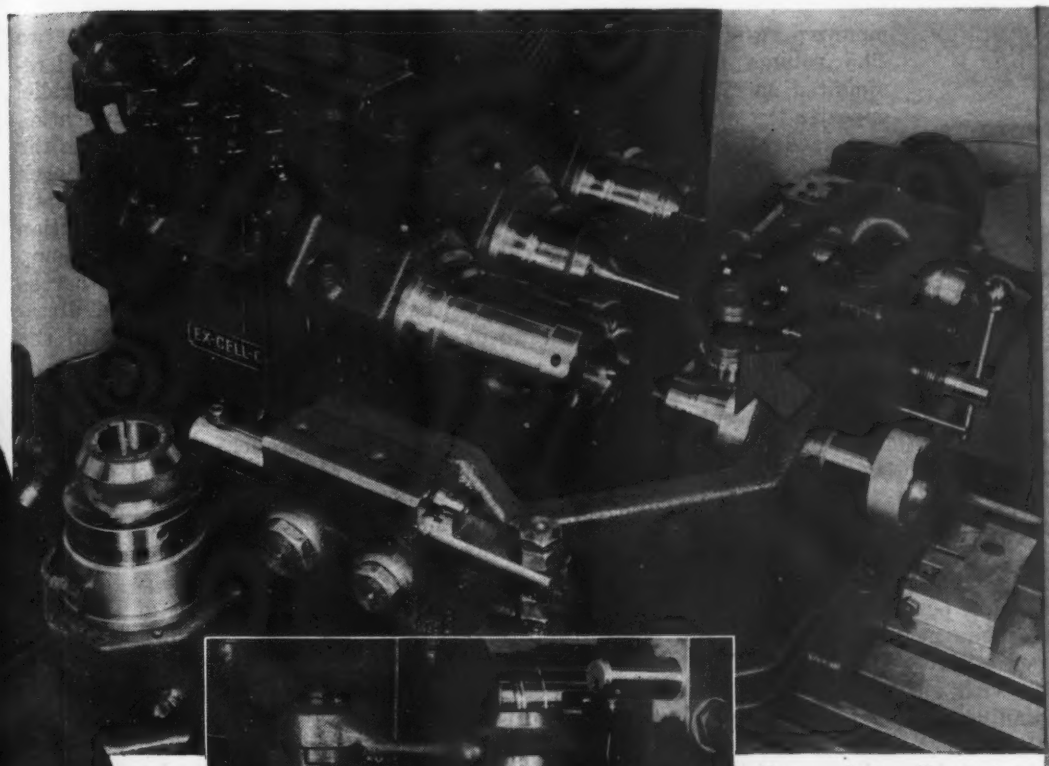
To obtain additional information on equipment described on this page, see lower part of page 240.

...scrap your obsolete

MULTIPLE OPERATIONS ON EX-CELL-O PRECISION BORING MACHINE SAVE HANDLING—SAVE MONEY

Obsolete machines are wasteful in today's competitive picture. Designed to help manufacturers meet the price problem that lies ahead, Ex-Cell-O Precision Boring Machines frequently offer increased production, less handling of parts, smaller floor space requirements, and greater economy through multiple operations. These savings are the result of Ex-Cell-O's many years of experience in the manufacture of precision machine tools . . . Typical of the way in which Ex-Cell-O makes possible lower unit costs is the machining of cast iron refrigeration pistons on an Ex-Cell-O Precision Boring Machine. Four operations (one on each of four pistons) are executed during each machine cycle. The steps are: turning the O.D., facing one end, finish boring the pin holes, and finishing the sides of two grooves. A surface finished at one station is used to locate the

EX-CELL-O CORPORATION



Upper photo: Close-up of fixture and tooling set-up to turn O.D., face end, bore pin holes and finish sides of ring grooves of refrigerator compressor piston (note part indicated by ⬆). Four operations are executed on four pistons during one cycle of this Ex-Cell-O Precision Boring Machine.

Lower photo: This vertical spindle mounted on the front of the machine carries a special collet chuck to hold the part for facing the end during the feeding stroke of the machine table.

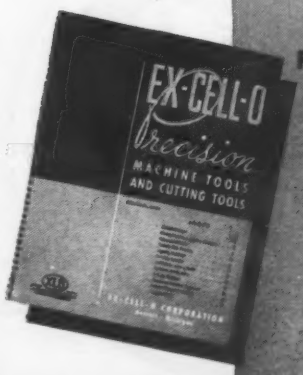
XLO
EX-CELL-O for PRECISION

- Standard and Special Multiple Way-Type Precision Boring Machines
- Continental Cutting Tools
- Precision Thread Grinding Machines
- Precision Lapping Machines
- Broaches and Broach Sharpening Machines
- Multiple Drilling and Other Special Purpose Machines
- Tool Grinders
- Hydraulic Power Units
- Grinding Spindles
- Drill Jig Bushings
- Aircraft and Miscellaneous Production Parts
- Fuel Injection Equipment
- R. R. Pins and Bushings
- Pure-Pak Paper Milk Bottle Machines

equipment!

part for the succeeding operation at the next station. Quantity production to close tolerances is obtained. *In boring, as in many other metal working operations, Ex-Cell-O engineering can show you the way to lower unit costs, through machines designed to meet your particular production problem.* Contact your nearest Ex-Cell-O representative today, or write direct to Ex-Cell-O, 1200 Oakman Boulevard, Detroit.

GET YOUR FREE COPY of this useful book. Illustrates and describes Ex-Cell-O's complete line of Precision Machine Tools, Cutting Tools, and facilities for parts production. Write for Ex-Cell-O Bulletin 27121.



DETROIT 6, MICHIGAN

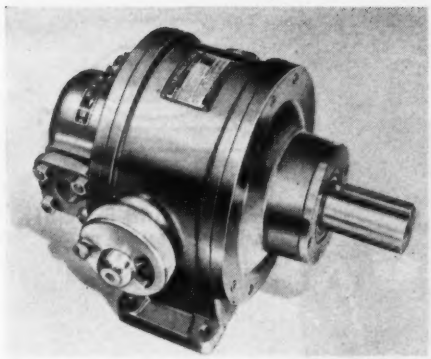


Fig. 1. Variable-delivery Superdraulic Pump

High-Pressure Superdraulic Pump

Pressures up to 5000 pounds per square inch and a variable delivery of from 0 to 17 gallons per minute at a speed of 1200 R.P.M. with an input of 40 H.P. are outstanding operating characteristics of the new Superdraulic pump brought out by Hydraulic Machinery, Inc., and Superdraulic Corporation, 12825 Ford Road, Dearborn, Mich. This pump is made in a constant-delivery model and in the variable-delivery model shown in Fig. 1 which can be equipped with different types of volume controls adapted for interchangeable mounting directly on the pump. The sensitive manual dial type control illustrated can be mounted on either side of the pump. The volume dial indicator can be mounted on either side of the pump opposite the pressure compensator.

A small oil circulating pump which circulates oil under zero pressure directly from the oil tank through the pump housing and back to the tank keeps the pump housing of the variable-delivery pump from overheating when the pump is operating under maximum pressure at zero or near zero delivery.

The Superdraulic pump is so designed that centrifugal force serves to maintain the plunger rollers in contact with an elliptical reaction ring designed as shown in Fig. 2. The plungers are fitted to cylinders in the rotor in one or more banks of eleven plungers each. The rotor turns on a fixed pintle, which has suitable ducts and ports for directing the oil inlet into those cylinders passing through the two opposite suction quadrants and also for directing the oil delivery out of those cylinders which are passing through the two opposite delivery quadrants. Thus each plunger makes two inlet and two delivery strokes per revolution. An equalizing axle with a roller at each end is attached by a universal type joint to the outer end of each plunger, as shown in Figs. 2 and 3.

The variable-delivery pumps have two banks of eleven plungers, each arranged in a single rotor, as shown in Fig. 3, the plungers in the two banks being arranged in parallel relationship. Each pair of parallel cylinders is in open communication by means of a drilled passage in the rotor. The plunger rollers of each bank roll against a separate elliptical reaction ring. These reaction rings are mounted in the pump housing, and are geared together so that they rotate in opposite directions in response to rotation of the volume control gear.

At the full delivery position the major axes of the elliptical reaction rings are parallel, and at the zero delivery position the major axes are 90 degrees apart. Under the latter condition, the net delivery stroke is zero, since the displacement of the plungers moving radially outward equals the displacement of the plungers moving radially inward in both the delivery and suction quadrants. As the angle between the major axes is reduced from 90 degrees the net plunger displacement increases. When this angle is diminished to the zero point, the major axes are parallel and both plungers of a pair of parallel plungers reciprocate in phase through the full delivery and suction strokes.

Provision is made for a simple spring type plunger to insure returning the plungers when the pumps are operated below their normal speed or at speeds below 100 R.P.M. 113

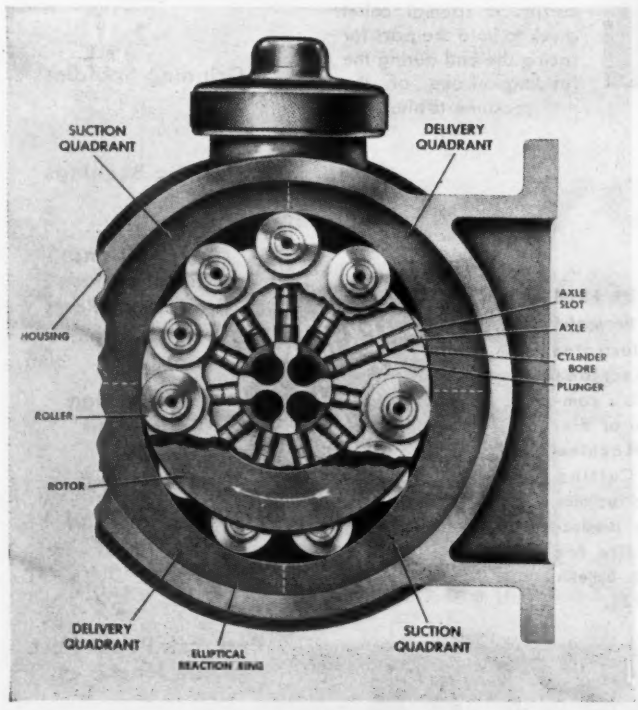


Fig. 2. Cross-sectional View of Superdraulic Pump Rotor Assembly

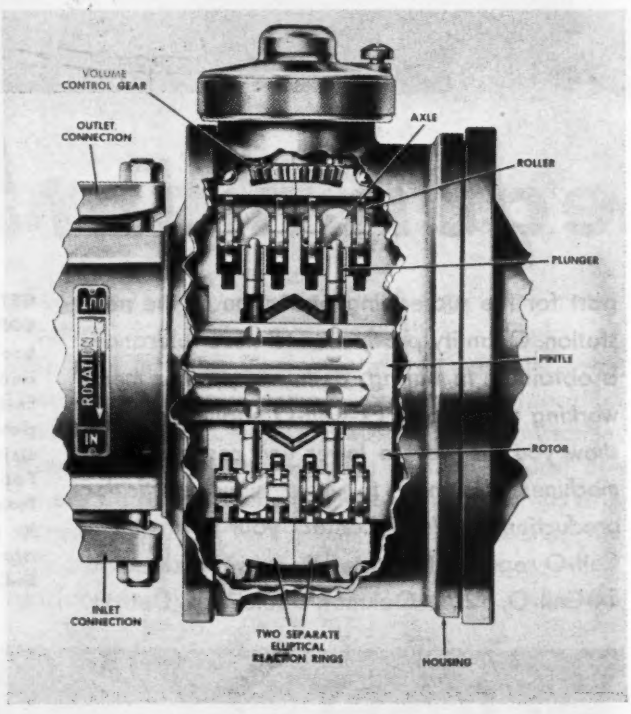
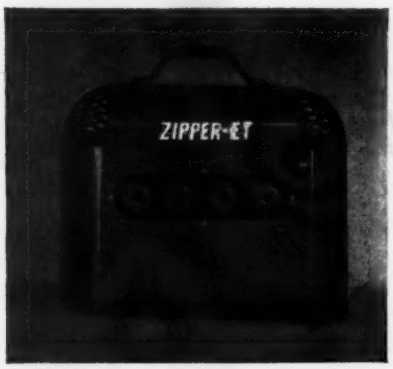


Fig. 3. Axial Section View of Variable-delivery Superdraulic Pump

To obtain additional information on equipment described on this page, see lower part of page 240.

Portable Arc-Welder

The Mid-States Equipment Corporation, 2429 S. Michigan Ave., Chicago 16, Ill., has added to its line of metal "Zipper" arc-welders, a small size portable electric welder known as the "Zipper-Et." This welder has been patterned after the Mid-States "Deluxe" welders, and operates as nearly like them as is possible within its range. It is recommended especially for light-duty, general-maintenance, and home-shop welding, and operates on 110-volt alternating current. The "Zipper-Et" welder, with all accessories, is self-contained, and

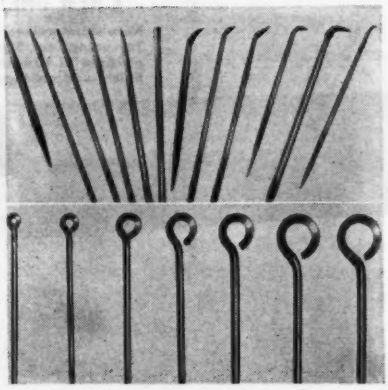


"Zipper-Et" Portable Arc-welder

has a total weight of approximately 40 pounds. This welder will handle five sizes of welding rod from 1/32 to 3/32 inch, inclusive. It will also handle 1/4-inch carbons in the 9000 arc torch. 114

Deburring Tools

A new line of hand-forged patented deburring tools has just been announced by the Metal Products Co., South Bend 24, Ind., which includes seven distinct types, each in varying sizes, designed to provide the right tool for every inaccessible deburring job. The channel knife type is furnished with sharp or square points for removing burrs from long channels and holes in machined castings. For deep holes or cross-channels, there are 45- and 90-degree angle hooks, as well as radius-curved ends in long or extra long sizes.



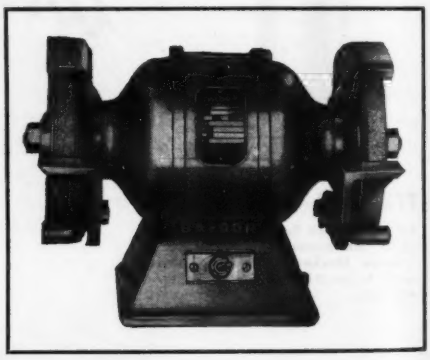
Hand-forged Deburring Tools Made by Metal Products Co.

The Series F straight scraping tool is useful for general scraping jobs, but is especially recommended for removing exterior burrs on machined castings. The "button-hook" shaped deburrer comes in seven graduated sizes. The complete line is made up of hollow-ground, hardened and specially tempered tools with operating shafts ranging from 4 1/2 to 9 inches in length.....115

Smith Gages for Setting Form Tools and Gaging Lengths

The F. H. Smith Mfg. Co., 3037-3047 Carroll Ave., Chicago 12, Ill., has developed two new gages designed to save time in screw machine departments or shops when quick, accurate gaging is necessary. The form-tool setting gage shown in Fig. 1 is designed primarily for use on Brown & Sharpe automatic screw machines but can also be employed on screw machines and lathes of other makes. It is used for setting the cutting edges of the forming tools in precisely the same positions in which they were before being removed for sharpening. This gage permits setting both front and back slides with equal speed and accuracy. The gages are made in three sizes for No. 0, No. 00, and No. 2 machines, and can be used for setting tools on spindles that run in either a clockwise or an anti-clockwise direction.

The adjustable gage shown in Fig. 2 is designed for quick checking of length dimensions. It is designed for use on the production line for gaging parts having more than one length dimension that must be held within given limits. Tolerances of 0.005 and 0.010 inch are established by ground steps on opposite ends of the adjustable limit ring, while the fixed end and adjustable handle are ground with flat surfaces. This adjustable length gage is available without the adjustable limit ring or with one or more limit rings for obtaining several combinations of tolerances in multiples of 0.005 inch up to 0.020 inch. 116



Baldor Grinder with Improved Design Features

Baldor Grinder

The Baldor Electric Co., 4400 Duncan Ave., St. Louis 10, Mo., has announced an improved 1/4-H.P. grinder designated No. 62. It is claimed that the capacitor type motor of this grinder will not burn out,

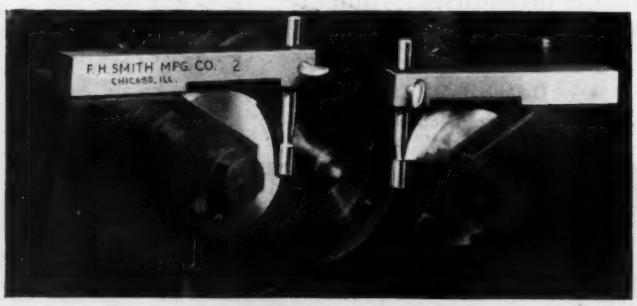


Fig. 1. Smith Form-tool Setting Gage

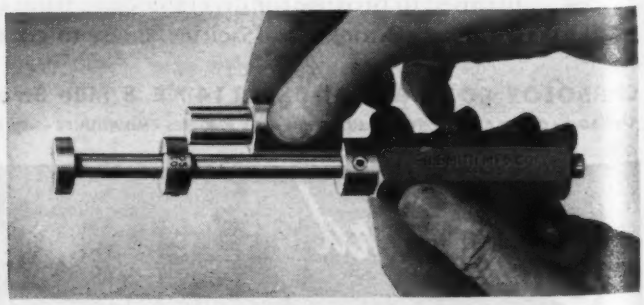


Fig. 2. Smith Adjustable Length Gage

To obtain additional information on equipment described on this page, see lower part of page 240.

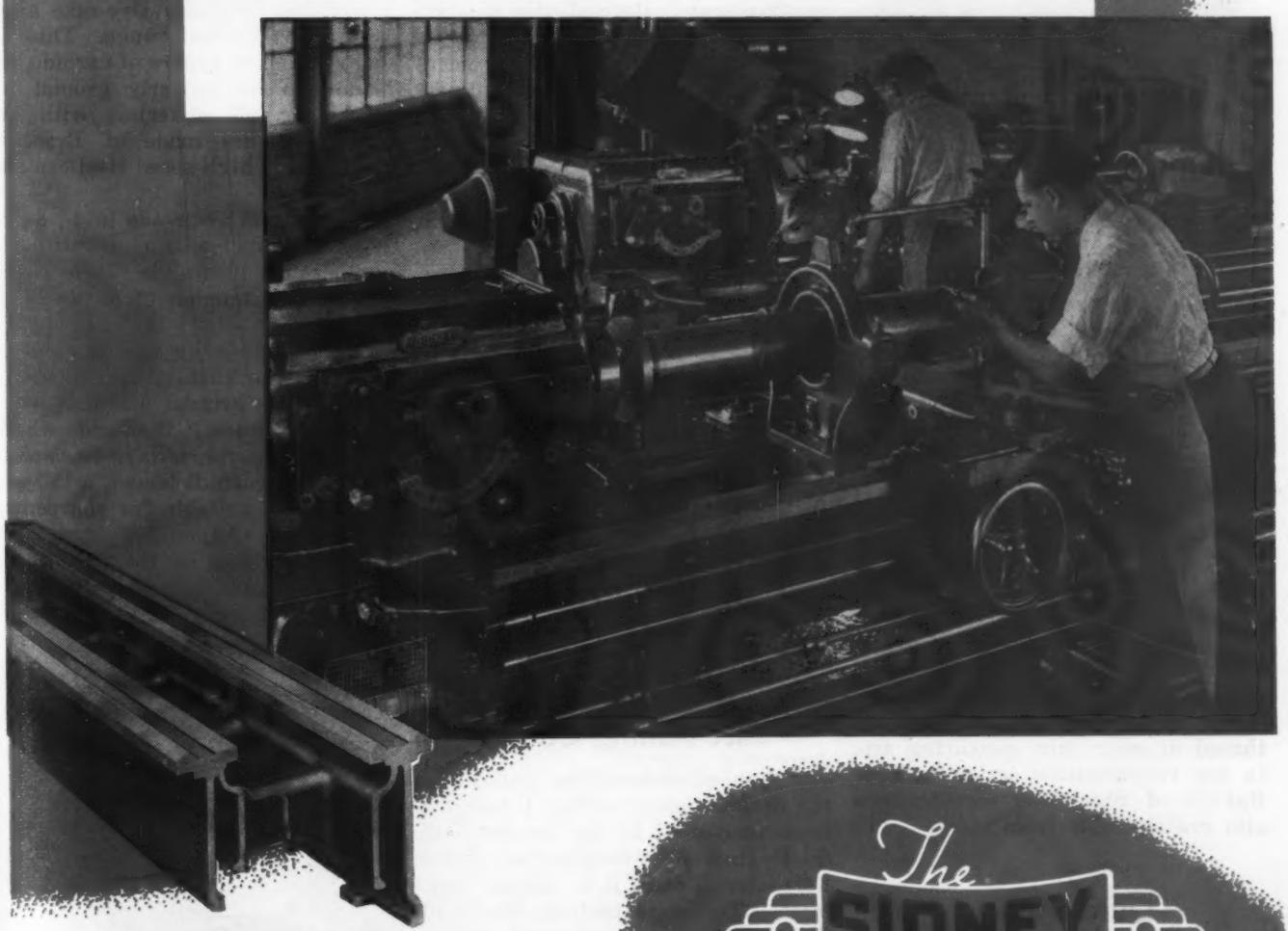
Versatility IS ANOTHER ASSET OF SIDNEY LATHES

● The wide range of work handled by Sidney Lathes is clearly illustrated in the accompanying illustration where two distinctly different jobs are being machined—one on a 20 inch lathe, the other on a 16 inch lathe.

Dependable accuracy is maintained on all jobs by means of the smooth flow of power to spindle thru the continuous tooth herringbone geared head and rigidity of construction which starts with the Sidney four wall bed design.

Ease of control—16 spindle speeds in geometrical progression—a wide range of thread and feed changes provide the versatility that makes the Sidney Lathe a profitable production unit in hundreds of plants.

For ultimate economy on your lathe operations specify Sidney. Bulletins on all sizes available.



FOUR WALL BED

The Sidney Lathe bed is designed for permanent accuracy under heaviest service. The four wall construction with cross girts at 12 inch intervals gives correct metal distribution and greater resistance to deflections and twisting strains. The two well proportioned outside Vee ways have greater bearing area to take down thrusts and accurately guide the carriage while the inside Vee ways and flat control head and tailstock alignment.

The SIDNEY MACHINE TOOL COMPANY
Builders of Precision Machinery
SIDNEY, OHIO

even though it is repeatedly overloaded. The grinder has tapered end bells that provide a wide clearance between the wheels and the motor frame. It is equipped with wheels 6 inches in diameter and 5/8 inch wide. 117

Reversible Plug and Thread Gage Sets

The Size Control Division of the American Machine & Gage Co., 4636 W. Fulton St., Chicago 44, Ill., has developed a complete line of standard

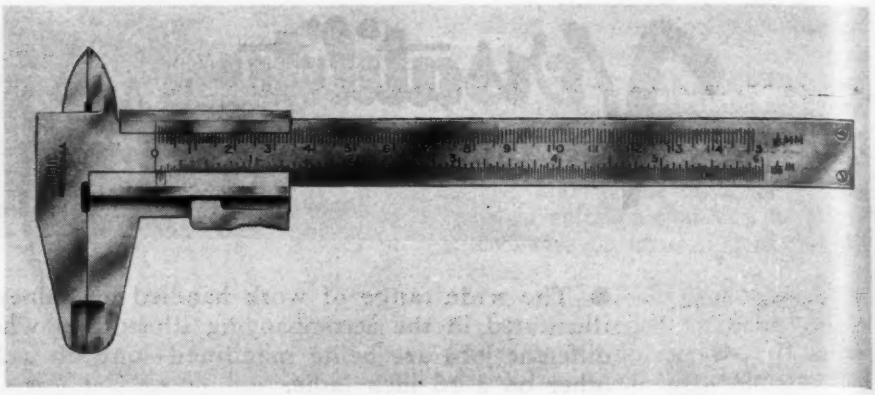
"Size Control" Reversible Plug and Thread Gage Set

reversible gage sets arranged in cabinets, as shown in the illustration. The thread gages are available in the "Size Control" (patent pending) reversible type, which provides two or more gage members for the price of one gage. These gage sets are made up to include either partial or complete thread series in a cabinet with individual compartments.

Plain plug gages of the "Size Control" reversible design are available in the old or new A.S.M.E. recommended drill sizes, as well as in fractional sizes with any combination of increments of 0.001 inch or any other size arrangement desired. Standard thread or gear wire measuring sets in any recommended series made to Bureau of Standards specifications also are available from stock..... 118

Quick-Action Vernier Calipers

The American Measuring Instruments Corporation, 240 W. 40th St., New York 18, N. Y., has added a quick-action vernier caliper to its line of precision measuring instruments. This new instrument is designed to perform many measuring operations which usually require several tools. It will measure inside diameters in thousandths inch as quickly and directly as outside dimensions. Depth measurements up to 5 inches are recorded on the same direct-reading scale. Beveled-edge measuring jaws designed to enter thread grooves permit direct measurement of thread diameters. These calipers are made in both stainless and tool steels. 119



Vernier Calipers Placed on the Market by the American Measuring Instruments Corporation

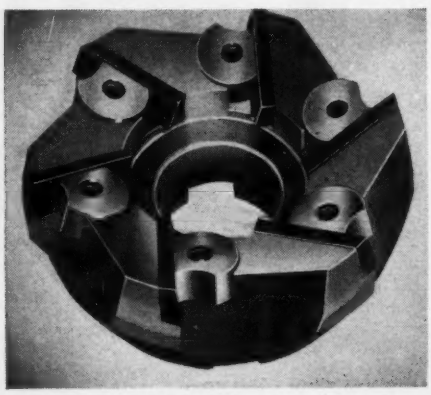


Fig. 1. Beaver Solid Carbide Blade Milling Cutter

Beaver Solid Carbide Blade Face-Milling Cutters

A line of face-milling cutters of the design shown in Fig. 1 has just been announced by the Beaver Tool & Engineering Corporation, 2850 Rochester Road, R. 1, Royal Oak, Mich. The solid carbide blades of these cutters can be changed quickly by releasing the locking wedges, and can be easily reset by the use of a dial indicator. The blades can be readily sharpened by using the simple jig shown in Fig. 2, which is furnished with the cutters. A complete set of sharpened blades can be kept on hand so that "down time" for changing cutters is reduced to a minimum.

Although this face-milling cutter is provided with a fixed, positive radial rake of 15 degrees, the blade can be sharpened to provide either a positive- or a negative-rake angle within the normal range. Thus by using different grades of carbide, the blade can be properly ground for machining all materials with one cutter. Blades made of Braecast, Tantung, or high-speed steel can also be used.

The cutters are made in 4-, 6-, 8-, 10- and 12-inch diameters, with the number of blades in each cutter equal to the number of inches in its diameter.

The grinding jig can be used on any machine that can be operated as a surface grinder and that has a magnetic chuck. Diamond wheels should, of course, always be used in sharpening carbide blades, a 180-grit wheel being suitable for sharpening all angles. Adjustable stops and angular surfaces on the jig provide means for grinding all surfaces to the required angles. 120

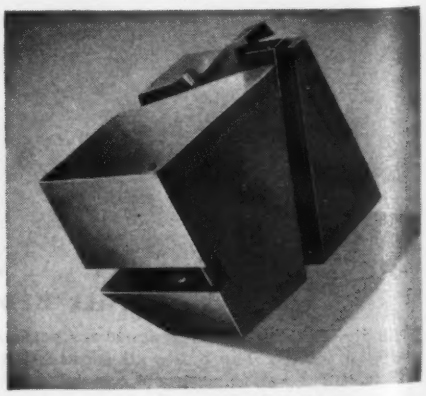
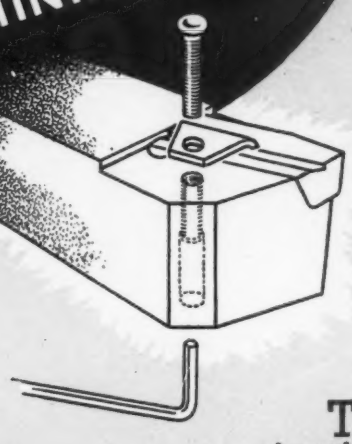


Fig. 2. Jig for Use in Grinding Blades of Cutter Shown in Fig. 1

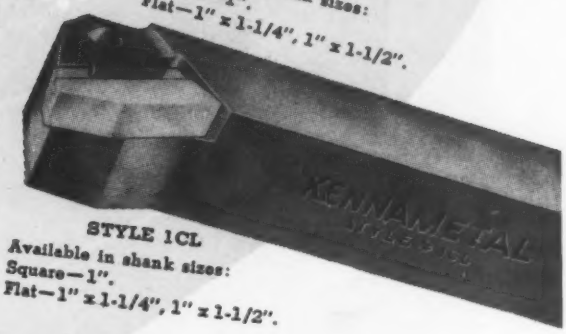
To obtain additional information on equipment described on this page, see lower part of page 240.

NOW—*New** *Clamped-on Tip* KENNAMETAL TOOLS FOR LIGHTER MACHINING JOBS



STYLE 11HD
Available in shank sizes:
Square—1-1/4", 1-1/2", 2".
Flat—1" x 2", 1-1/2" x 2".

STYLE 11CL
Available in shank sizes:
Square—1".
Flat—1" x 1-1/4", 1" x 1-1/2".



STYLE 1CL
Available in shank sizes:
Square—1".
Flat—1" x 1-1/4", 1" x 1-1/2".

STYLE 12HD
Available in shank sizes:
Square—1-1/4", 1-1/2", 2".
Flat—1" x 2", 1-1/2" x 2".

STYLE 12CL
Available in shank sizes:
Square—1".
Flat—1" x 1-1/4", 1" x 1-1/2".

STYLE 2CL
Available in shank sizes:
Square—1".
Flat—1" x 1-1/4", 1" x 1-1/2".

TWO new styles of tools—straight and offset shanks—with clamped-on Kennametal tips, have been developed so that the outstanding operating and maintenance advantages that characterize our now well-known HD line for heavy duty work, may also be realized on lighter machining jobs. Among the advantages provided by these new tools are:

More consistent performance and greater durability from thermally strain-free assembly;

Smooth, unimpeded chip flow assured by perfected clamping arrangement, correctly positioned;

Exceptionally strong Kennametal tip—diamond ground on bottom face—firmly supported by plane surface of heat-treated steel shank;

Dull tips can be advanced, resharpened time and again, and major part utilized—tip only is reground;

Fewer tools to stock—many tips can be used during life of one shank;

Tips of different grades can be clamped in same shank;

Tips can be supplied with permanent, molded-in chip breaker, constant in depth, but adjustable in width by varying amount ground from end, or side cutting edges.

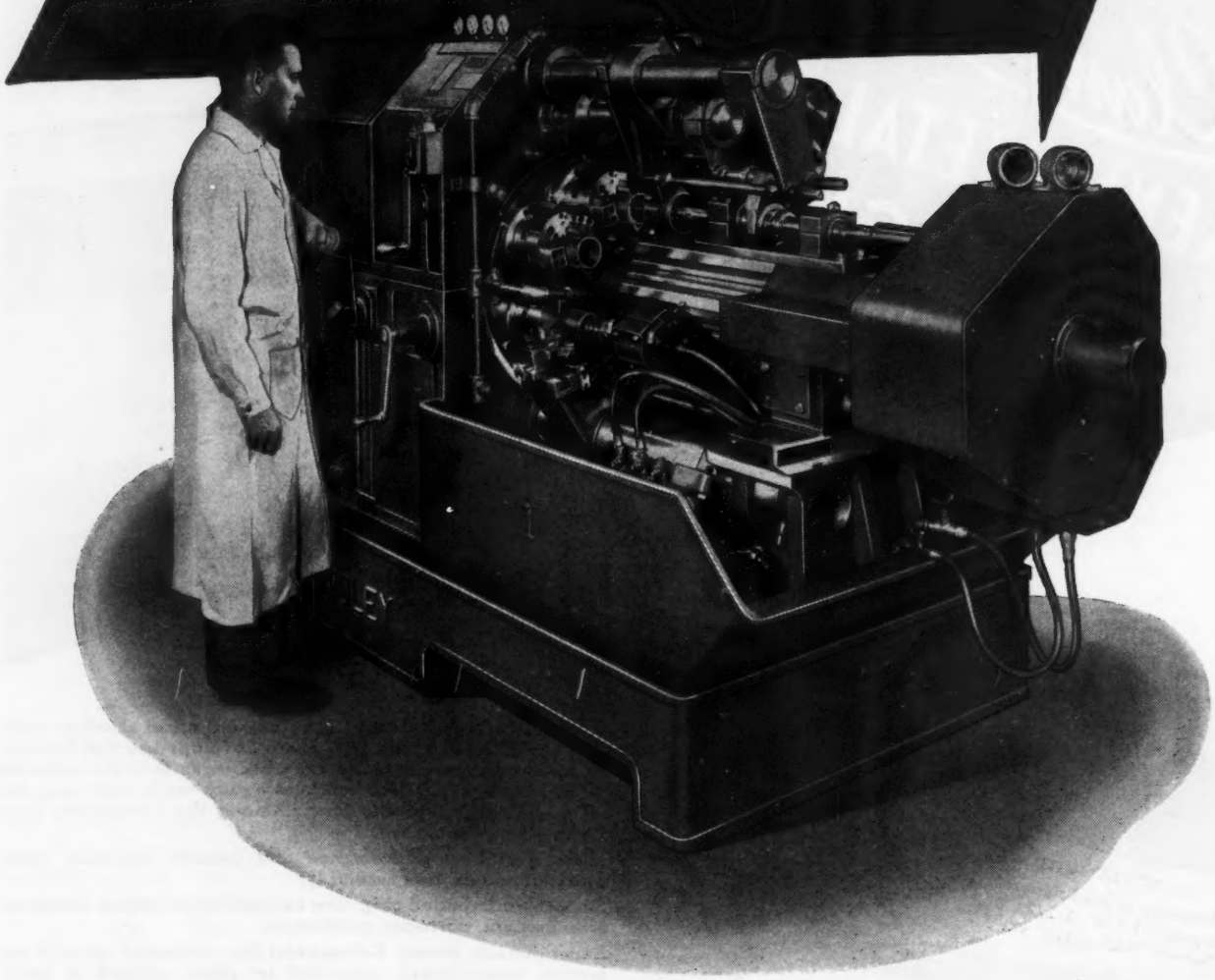
Illustrations show the new styles, as well as the widely used HD style, of clamped-on-tip Kennametal tools. Captions indicate sizes available.

SEND TODAY FOR SUPPLEMENT 2 . . .

. . . of Catalog 45, for complete specifications and prices.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
TRADE MARK REG. U. S. PAT. OFF.
KENNAMETAL Inc., LATROBE, PA.

LEADERSHIP
PROVED BY HUNDREDS OF CASE HISTORIES....



Our "case history" files illustrate the fact that the speed . . . accuracy and versatility of New Britain Multiple Spindle Automatics provide the right combination for countless machining operations. Some are jobs which could not be performed in one operation on any machines except New Britains. Others illustrate high-speed, accurate machining of extremely hard metals requiring deep cuts. Others are perfectly simple pieces . . . remarkable because of the economies made possible by switching from single spindle machines to New Britains.

New Britain engineers stand ready to show you how the profit possibilities of New Britain Automatic Screw and Chucking Machines can be applied to your product . . . Write us about *your* machining problems.

NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

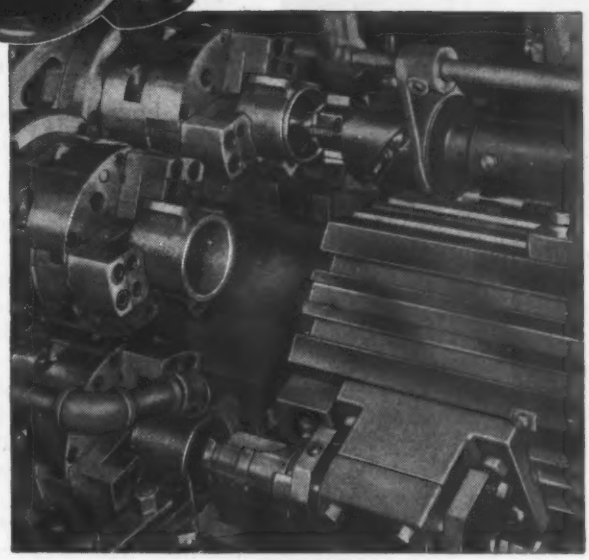
...HERE'S ANOTHER

Houdaille Malleable Iron
Shock Absorber Housing

The inside surface of this shock absorber housing must be within a specified tolerance of .002" at all points. This requires not only preservation of accurate diameter, but absolute squareness of the end surface with the cylinder.

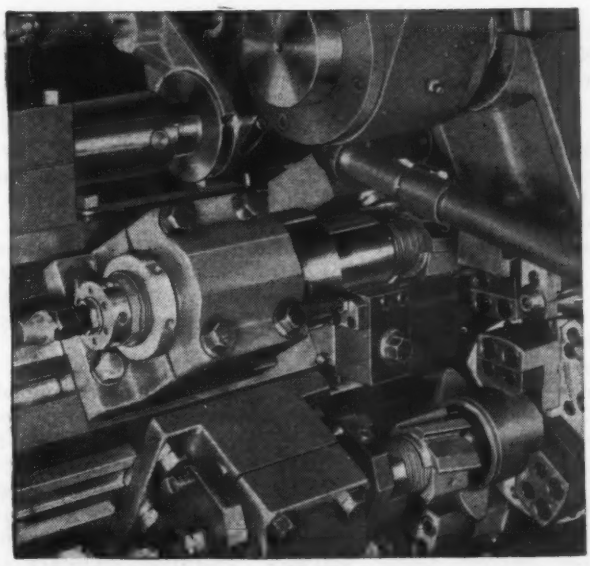
The remarkable feature of the operation is that Houdaille* turns this part out in 29 seconds, from rough casting to finished piece on a battery of New Britain Model 675 Multiple Spindle Automatic Chucking Machines . . . *with no finish grinding required.* The production of 122 pieces per machine per hour, day-in day-out is an ideal instance of how the speed and accuracy of New Britains combine to give you the utmost in production and low cost per piece.

*Pronounced—Hoo-dye



FRONT VIEW

Entirely open end construction provides accessibility for simplified chucking, cutting tool and attachment setup.

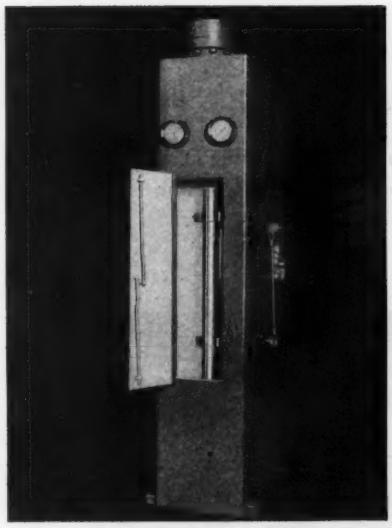


★

REAR VIEW

Wide open end construction provides extra large chip space . . . accessibility from three sides and from above that permits excellent visibility and easy tool adjustment.

New Britain builds a complete line of Multiple Spindle Automatic Chucking Machines . . . four, six and eight spindles up to 12" capacity . . . Also a complete line of Multiple Spindle Automatic Screw Machines to 2¼" capacity.



Hydraulic Tube-testing Press

Beatty Hydraulic Tube-Testing Press

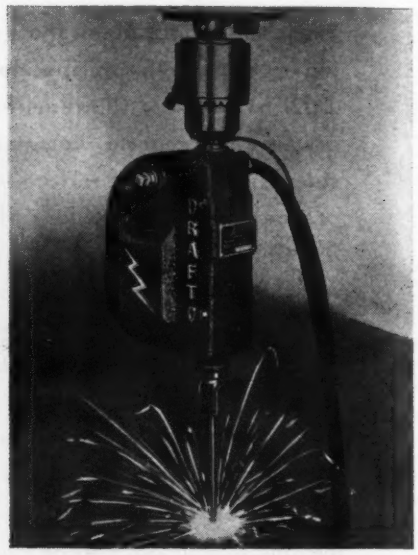
The Beatty Machine & Mfg. Co., Hammond, Ind., has brought out a new 25-ton hydraulic tube-testing press, designed for testing tubes up to 3 1/4 inches inside diameter and 48 inches long at 4800 pounds per square inch hydrostatic internal pressure. Within the limitations of its pressing and space capacities, this tester can also be used for tubes of other dimensions when the proper ram attachments are employed.

The testing press has a stroke of 8 inches, daylight opening of 57 inches, and a throat depth of 6 inches. The pressing speed is 34 inches per minute, and the return speed 68 inches per minute. 121

Disintegrator for Removing Broken Taps and Drilling Tungsten Carbide

An improved Model 3 metal disintegrator designed for the rapid removal of broken taps and drills from work in process of manufacture without injuring the work-piece has been announced by the Drafto Corporation, Cochranton, Pa., and is being distributed nationally by the Greenleaf Corporation, Wilkinsburg 21, Pittsburgh, Pa.

The new disintegrator will bore through hardened high-speed steel at the rate of about 1/16 inch per minute. It can be used to drill round holes or holes of practically any shape through tungsten carbide and Stellite, and will cut virtually all hard metallic materials. The equipment is available in three models, Models A and B, being of the floor type, are completely self-contained and can be rolled to any part of the plant. Model C is a compact portable table or bench model consisting of controls, transformer, coolant tank, pump, and working head incorporated in one unit. Electrodes available for use in these disintegrators range in size from 0.065 to 0.310 inch in diameter, and in square shapes up to 1/2 inch. Stock electrodes of round, hexagonal, and square shape, as well as special shapes, can be furnished. 122



Drafto Metal Disintegrator

Coming Events

APRIL 1-4 — Spring meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Chattanooga Tenn. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

APRIL 3-5—National Aeronautical meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel New Yorker, New York City. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

APRIL 8-12 — Annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS, and Exposition under the auspices of the Society, in Cleveland, Ohio. For further information, address executive secretary, Harry E. Conrad, 1666 Penobscot Bldg., Detroit, Mich.

APRIL 9-10 — Tenth annual ELECTRIFICATION FORUM to be held at the William Penn Hotel, Pittsburgh, Pa., under the sponsorship of the Westinghouse Electric Corporation, Pittsburgh 30, Pa.

APRIL 22-27 — NATIONAL PLASTICS EXPOSITION in Grand Central Palace, New York City, under the sponsorship of the Society of the Plastics Industry, 295 Madison Ave., New York 17, N. Y., who will hold a convention concurrently with the exposition.

APRIL 22-24—Spring Production Conference of the AMERICAN MANAGEMENT ASSOCIATION at the Hotel Pennsylvania, New York City. For further information, address American Management Association, 330 W. 42nd St., New York 18, N. Y.

JUNE 2-7 — Summer meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at French Lick Springs Hotel, French Lick Springs, Ind. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York 18, N. Y.

JUNE 3-6—Aviation Division Meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Los Angeles, Calif. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 12-15—Oil and Gas Power meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Milwaukee, Wis. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 17-20 — Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Detroit, Mich. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 20-22 — Conference of the NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION at Atlantic City. W. Lane Witt, president and general manager, 100 E. Ohio St., Chicago 11, Ill.

JUNE 21-22—Applied Mechanics meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Buffalo, N. Y. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

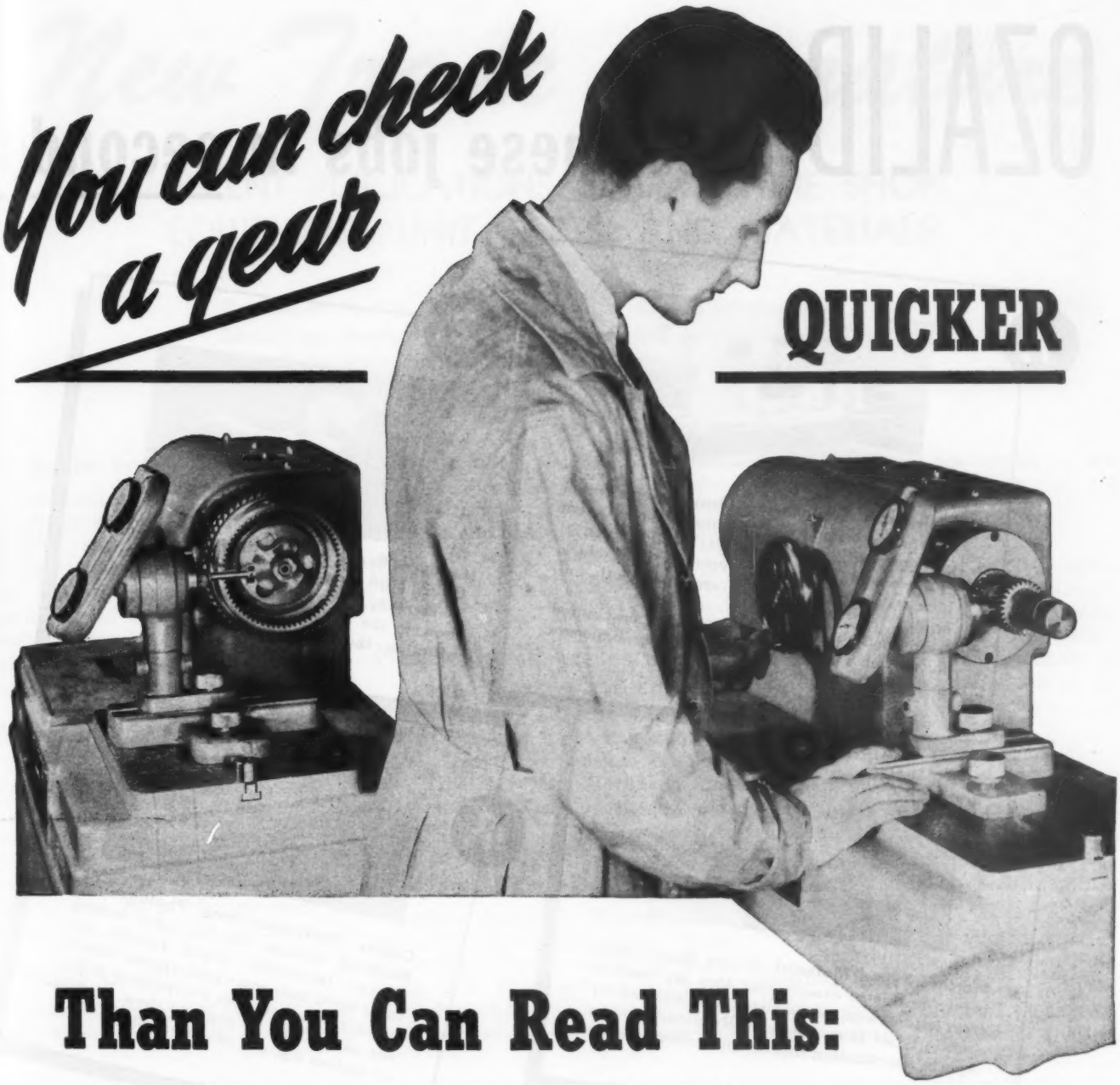
JUNE 24-28—Forty-ninth annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Hotel Statler, Buffalo, N. Y., in conjunction with the seventh exhibit of testing apparatus and related equipment. Additional information can be obtained from C. L. Warwick, executive secretary, 260 S. Broad St., Philadelphia 2, Pa.

SEPTEMBER 16-20 — 1946 Exhibit and conference of the INSTRUMENT SOCIETY OF AMERICA at the William Penn Hotel in Pittsburgh, Pa.

SEPTEMBER 30-OCTOBER 3 — Fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Boston, Mass. Clarence E. Davies, secretary, 29 W. 39th St. New York 18, N. Y.

To obtain additional information on equipment described on this page, see lower part of page 240.

You can check a gear QUICKER



Than You Can Read This:

With a Michigan Series 1200* lead checker it is the work of only a few seconds to check both sides of four equally spaced teeth on a gear for lead, right alongside the gear finishing machine.

The machine is designed for shop use —in the open—requiring no covers, dust-protection, etc. To set it up for any gear it is only necessary to install the correct master lead. Once set up, it is a *foolproof* single purpose precision machine. Indexing is quick and positive. There are no settings to compute or individual set-ups to make.

It is easily re-set however. For a different size gear, just move the indicator mount in or out. For a gear of different helix, slip in the corresponding MULTIPLE-THREAD master lead. To check an internal gear, change the pointer on the indicator.

The two dial indicators are for checking facing tooth surfaces. The machine may be used to check an internal or external gear* up to 10 inch OD, in routine production—with laboratory accuracy.

For further data ask for Bulletin No. 1200-46.

**For gears with helix angles above 45° use a model 1200-A.*

ORIGINATORS of GEAR-SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

OZALID does these jobs in seconds!

1.

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2.

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3.

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4.

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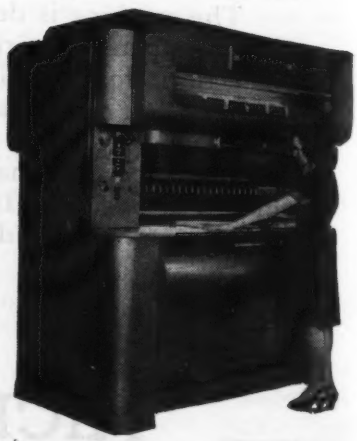

OZALID

DIVISION OF GENERAL ANILINE & FILM CORPORATION
JOHNSON CITY, NEW YORK

Ozalid in Canada—Hughes-Owens Co., Ltd., Montreal

New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of this page the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the April, 1946, Number of MACHINERY

Hydraulic Equipment

HYDRAULIC MACHINERY, INC., 12825 Ford Road, Dearborn, Mich. Bulletin entitled "Your Production Problems," describing the engineering, laboratory, and production departments of the concern, and illustrating examples of special hydraulic machinery, test equipment and hydraulic power units. ——1

Steel Collars

MASSEY MACHINE COMPANY, 800 Pearl St., Watertown, N. Y. Bulletin CR-46, containing engineering data on a new line of hardened and ground steel collars with hollow-head set-screw for use as tool stops, shaft collars, and parts of jigs and fixtures. —— 2

Welding Chart

ARCOS CORPORATION, 1515 Locust St., Philadelphia 2, Pa. Reference chart on alloy welding, containing data on high- and low-alloy electrodes, including corrosion and heat resistance of the various types; weld metal surfacing; chemistry of the weld metal; and welding current and voltage tables. ——3

Precision Castings

HAYNES STELLITE CO., UNIT OF UNION CARBIDE AND CARBON CORPORATION, Kokomo, Ind. Catalogue entitled "Haynes Precision Castings for High-Strength, Hardness, and Resistance to Wear, Heat, and Corrosion." —— 4

Grinding Wheel Data

SAFETY GRINDING WHEEL & MACHINE CO., Springfield, Ohio. Booklet entitled "Safety Grinding Wheel Facts and Figures," containing a fund of useful information for those concerned with grinding, including tables specifying the wheels to use for various classes of work. ——5

Corrosion of Steels

CARNEGIE-ILLINOIS STEEL CORPORATION, 429 Fourth Ave., Pittsburgh 19, Pa. Booklet entitled, "Corrosion of Steels," indicating how various commercial steels can reasonably be expected to resist the attack of atmospheric corrosion. —— 6

Stainless-Steel Castings and Shock-Resisting Tool Steel

ALLEGHENY LUDLUM STEEL CORPORATION, Brackenridge, Pa. Blue Sheets containing reference data on Allegheny stainless-steel castings and shock-resisting steel for tools and machine parts. ——7

Testing Instruments

STEEL CITY TESTING LABORATORY, 8843 Livernois Ave., Detroit 4, Mich.

To Obtain Copies of New Trade Literature

listed on pages 239-242 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue to:

MACHINERY, 148 Lafayette St., New York 13, N. Y.

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Name.....*Position or Title*.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

Firm.....

Business Address.....

City.....*State*.....

[SEE OTHER SIDE]

Bulletin illustrating and describing six different models of Brinell testing machines, including manually operated and portable types, as well as a universal model. 8

Precision Grinding

ACE MFG. CORPORATION, 1207 E. Erie Ave., Philadelphia 24, Pa. Catalogue entitled "Fine Precision Geared to Faster Production," describing the precision-grinding, production-machining, metal-stamping, and heat-treating facilities of this company. 9

Industrial Cleaning Equipment

OAKITE PRODUCTS, INC., 26 Thames St., New York 6, N. Y. Booklet 4543R2, entitled "Steam Detergent Cleaning," describing the savings effected by steam-detergent cleaning methods, and many applications of the process. 10

Tungsten-Carbide Tools

METAL CARBIDES CORPORATION, Youngstown, Ohio. Catalogue 46-WP, containing data on Talide-tipped centerless grinder blades, dies, bushings, gages, etc., including engineering information on the application of Talide metal. 11

Diamond Wheels for Sharpening Carbide Tools

WICKMAN CORPORATION, 15533 Woodrow Wilson Ave., Detroit 3, Mich. Catalogue announcing a complete line of resinoid-bonded diamond abrasive wheels for sharpening carbide tools. 12

Grinding Machine Engineering Data

CINCINNATI GRINDERS INCORPORATED, Cincinnati 9, Ohio. Publication G-536, containing engineering data on Cincinnati center type and centerless grinding machines and centerless lapping machines. 13

Universal Gear-Checking Machines

NATIONAL BROACH & MACHINE Co., 5600 St. Jean, Detroit 13, Mich. Bulletin entitled "Check Gear Dimensions Accurately and Quickly with the Red Ring Universal Gear Checker." 14

Drawing Compounds

E. F. HOUGHTON & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. Folder briefly describing six Houghton drawing compounds, suitable for practically all drawing, stamping, and punching operations, and their application. 15

Welding and Cutting Electrodes

METAL & THERMIT CORPORATION, 120 Broadway, New York 5, N. Y. Booklet describing the use of Murex electrodes for under-water cutting and welding, as well as for cutting in the open air. 16

Metal Cleaning Machinery

HOWARD ENGINEERING & MFG. Co., 2258 Buck St., Cincinnati 14, Ohio. Catalogue containing detailed information on the design and application of Howard metal cleaning and finishing machinery. 17

Variable-Speed Hydraulic Units

PHILADELPHIA GEAR WORKS, INC., Erie Ave. at G St., Philadelphia 34, Pa. Circular containing engineering data on Philadelphia variable-speed hydraulic units, including typical performance curves. 18

Transmission Equipment

BROOKS EQUIPMENT CORPORATION, 217 Hudson St., Hoboken, N. J. Catalogues on new type miter gearboxes and brackets; flexible gear turrets for connecting shafts; and a new design steel universal joint. 19

Universal Fly Cutters

NEW-FIELD MACHINED PARTS Co., 549 W. Randolph St., Chicago 6, Ill. Circulars descriptive of two new models of New-Field universal fly cutters, designed especially for application on shell end-mill arbors. 20

Cutting Tools

DELLOY METAL CORPORATION, 1221 E. Erie Ave., Philadelphia 24, Pa. Revised catalogue, covering the general-purpose, cast-alloy, and tungsten-carbide cutting tools made by this company. 21

Automatic Clutches

HARDINGE Co., INC., York, Pa. Bulletin 45, describing the "Auto-Centri" clutch, available in sizes from fractional horsepower to 5000 H.P. for any type power drive. 22

Corrosion-Resistant Valves

ALLOY STEEL PRODUCTS Co., INC., Linden, N. J. Bulletin on stainless-

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To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 202-236 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in April, 1946, MACHINERY.

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To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 200-201, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in April, 1946, MACHINERY.

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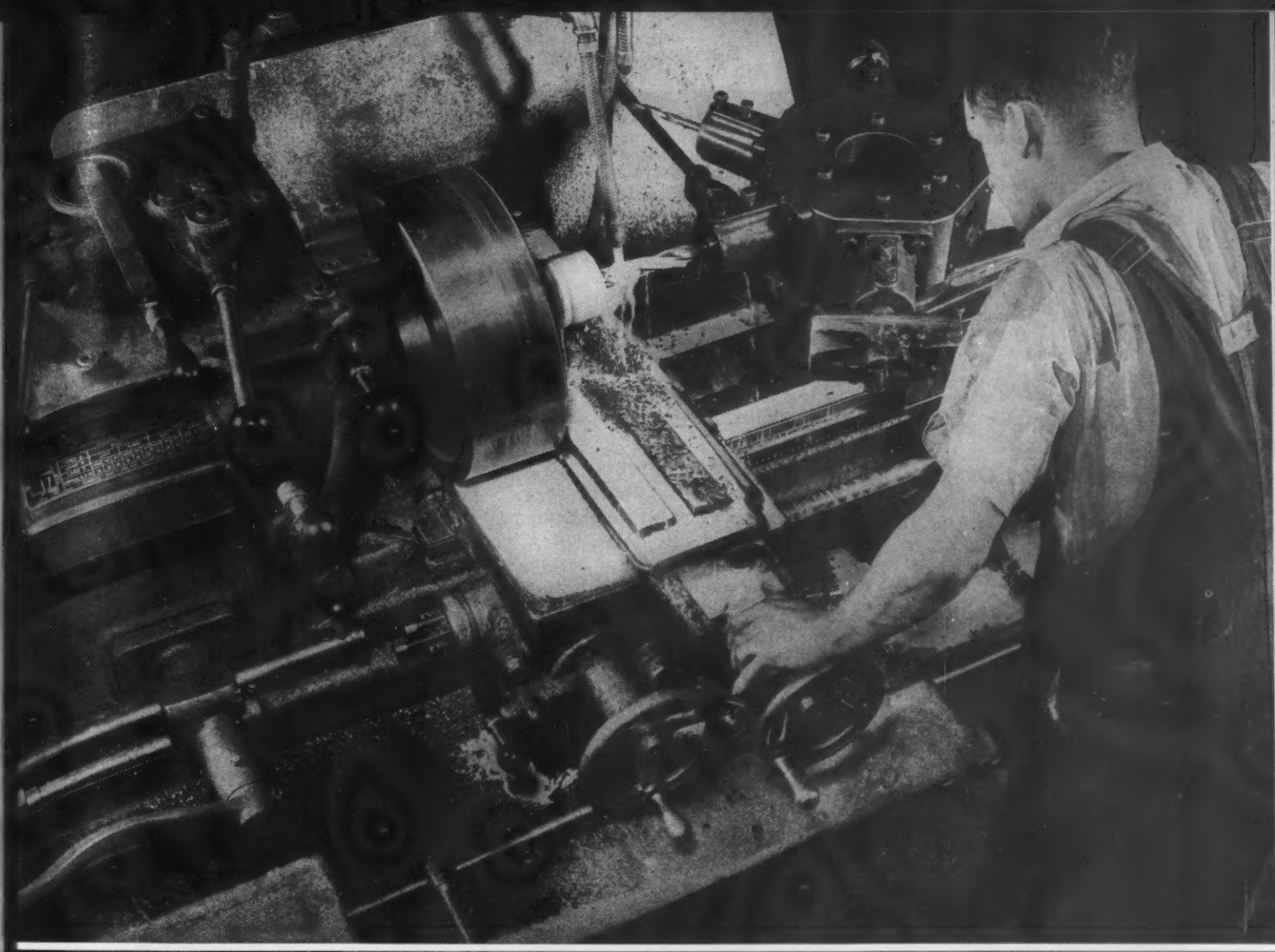

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steel corrosion-resistant valves. Also, Technical Information Bulletin No. 2, on "Aloyco-20," a corrosion-resistant alloy. ——— 23

Swaging Machines

STANDARD MACHINERY Co., Providence 7, R. I. Catalogue Section SM, describing the details of this company's line of swaging machines, including the new cable and hydroformer types. ——— 24

Metal-Marking Equipment

WM. A. FORCE & Co., INC., 216 Nichols Ave., Brooklyn 8, N. Y. Catalogue showing a complete line of metal indenting, marking, and numbering machines, and other marking equipment. ——— 25

Adjustable Lapping Tool

FLEXOLAP MFG. Co., 2156 W. Fulton St., Chicago 12, Ill. Leaflet illustrating and describing a new precision lap known as the "Flexolap," designed especially for tool and die work. ——— 26

Optical Measuring and Inspecting Equipment

OPTRON LABORATORY, 2657-B Salem Ave., Dayton 6, Ohio. Catalogue describing the Optron interference viewer for checking gage-blocks and other precision articles. ——— 27

Vibration-Control Equipment

KORFUND Co., INC., 48-15 Thirty-second Place, Long Island City 1, N. Y. Bulletin LK 550, describing a new type simplified steel-spring "Vibro-Isolator" for loads up to 12,000 pounds. ——— 28

Crank Shapers

SMITH & MILLS Co., 2887 Spring Grove Ave., Cincinnati 25, Ohio. Catalogue 45, containing specifications, illustrations, and complete descriptions of the Smith & Mills line of crank shapers. ——— 29

Fasteners

SIMMONS FASTENER CORPORATION, Box 1230, Albany 1, N. Y. Catalogue containing the latest data and specifications on "Quick-Lock," spring-lock, and lock-nut fasteners. ——— 30

Portable Conveyors

METZGAR Co., Grand Rapids, Mich. Circular illustrating and describing the new Metzgar "Power Helper," a portable power-driven horizontal and booster type conveyor. ——— 31

Automatic Work-Sizing Device

NORTON Co., Worcester 6, Mass. Circular illustrating and describing the Norton automatic work-sizing device, which holds cylindrical work size within limits of 0.0001 inch. 32

Electronics

WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh 30, Pa. Booklet entitled, "Electronics Digest," recording the latest developments in the application of electronics. ——— 33

Polishing Wheels

RAYBESTOS - MANHATTAN, INC., MANHATTAN RUBBER DIVISION, Passaic, N. J. Bulletin 6881-A, describing new finishing wheels with synthetic rubber bond. ——— 34

Injection Molding Machines

WATSON-STILLMAN Co., Roselle, N. J. Bulletin 623-A, descriptive of the Watson-Stillman 1-ounce hydraulically operated injection molding machine. ——— 35

Hydraulic Power Unit

GEORGE D. ROPER CORPORATION, Rockford, Ill. Bulletin giving detailed information on the "Roper-Pac," a self-contained hydraulic power unit. ——— 36

Centerless Grinding Machines

TRIPLEX MACHINE TOOL CORPORATION, 125 Barclay St., New York 7, N. Y. Catalogue 1507E, describing the design features of Lidkoping centerless grinding machines. ——— 37

Induction Heating Units

LEPEL HIGH FREQUENCY LABORATORIES, INC., 39 W. 60th St., New York 23, N. Y. Catalogue on Lepel high-frequency induction heating units and their application. ——— 38

Power Brushes

OSBORN MFG. Co., 5401 Hamilton Ave., Cleveland 14, Ohio. Booklet entitled "A Report on How to Select Power Brushes for Manufacturing Operations." ——— 39

Controlled Atmospheres

LINDBERG ENGINEERING Co., 2450 W. Hubbard St., Chicago 12, Ill. Bulletin 190, on Lindberg controlled atmospheres for heat-treating. ——— 40

Gapless Piston-Rings

AUTO-DIESEL PISTON RING Co., 3269 Superior Ave., Cleveland 14, Ohio. Leaflet describing a new type of gapless piston-ring known as the "Helicam." ——— 41

Pneumatic Tools

INGERSOLL-RAND, 11 Broadway, New York 4, N. Y. General catalogue 5000, covering the complete line of Ingersoll-Rand air tools and accessories. ——— 42

Precision Lathe with Dovetail Bed

HARDINGE BROTHERS, INC., Elmira, N. Y. Bulletin DV59, illustrating and describing an improved type of precision lathe with dovetail bed. 43

Portable Welding Outfit

PATENT SPECIALTIES, INC., 4020 Tenth Ave., New York 34, N. Y. Folder announcing the "Magic Wand" welder, a portable welding outfit in a carrying case. 44

High-Speed Tool Bits

CRUCIBLE STEEL Co. OF AMERICA, 405 Lincoln Ave., New York 17, N. Y. Folder containing complete data on Rex high-speed tool bits. ——— 45

Torque Wrenches

Jo MFG. Co., 8442 Otis St., South Gate, Calif. Catalogue illustrating and describing the Jo line of torque wrenches and other tools. ——— 46

Ampco Monel Metal Tools

AMPCO METAL INC., 1745 S. 38th St., Milwaukee 4, Wis. Bulletin 76, entitled, "Safety Tools of Monel Metal." ——— 47

Portable Flame-Cutting Outfit

VICTOR EQUIPMENT Co., 844 Folsom St., San Francisco 7, Calif. Circular 69, on the Victor emergency pack type, flame cutting outfit. ——— 48

Broaching Machines

ZAGAR TOOL, INC., 23880 Lakeland Blvd., Cleveland 17, Ohio. Circular entitled "Production Broaching on Zagar Broaching Machines." ——— 49

Air-Operated Devices

MEAD SPECIALTIES Co., 4120 N. Knox Ave., Chicago 41, Ill. New edition of the company's catalogue on air-operated devices. ——— 50

Arc-Welding Accessories

HOBART BROTHERS Co., Troy, Ohio. Folder DM-709, announcing a complete new line of arc-welding accessories. ——— 51

JALLOY is a special steel particularly applicable for machine parts that are subjected to dynamic stresses, sudden shocks or abrasive action. It can be forged and heat treated to obtain the desired physical properties. Write for further information.

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News of the Industry

California

B. H. RANDALL, formerly process engineer with Fisher Body Division, General Motors Corporation, Detroit, Mich., and plant manager of Dettary Engineering Co., Detroit, has been made product design engineer of the Day and Night Mfg. Co., Monrovia, Calif., manufacturer of heating equipment.

CLINTON E. STRYKER has been elected president and general manager of the Adel Precision Products Corporation, Burbank, Calif. Mr. Stryker was formerly vice-president and assistant to the president of the Nordberg Mfg. Co., Milwaukee, Wis.

Illinois and Missouri

P. J. PATTON, JR., has been made regional manager for the Industrial Division, Ransome Machinery Co., Dunellen, N. J., with offices at 400 W. Madison St., Chicago, Ill., where he will be in charge of sales in the Middle Western area.

F. C. HAWKS has joined the sales staff of Ampco Metal, Inc., Milwaukee 4, Wis., as a field engineer specializing in mill products. His headquarters will be at the company's office at 600 S. Michigan Ave., Chicago, Ill. Mr. Hawks was previously with the Bridgeport Brass Co.

IDEAL COMMUTATOR DRESSER CO., Sycamore, Ill., announces that the company has been terminated as a partnership, and is succeeded by a corporation known as IDEAL INDUSTRIES, INC. There has been no change in management, personnel, location, or manufacturing methods.

GEORGE SMITH, who originally joined the Conco Engineering Works, Mendota, Ill., in 1935, has returned to the organization after two and one-half years' service as a lieutenant in the U. S. Navy. He is now filling the position of sales supervisor for Conco cranes and hoists.

CHICAGO METAL HOSE CORPORATION announces that it has acquired the entire capital stock of the APEX MACHINE CO., Elgin, Ill. The production facilities of the latter company will be operated as a division of the Chicago Metal Hose Corporation.

W. D. CLEAVENGER has been appointed Chicago district manager of the American Welding & Mfg. Co., with headquarters at 332 S. Michigan Ave., Chicago. Mr. Cleavenger succeeds F. L. SCHNEIDER, who has joined the Wallace Supplies Mfg. Co.

HENRY L. LEMAY has been named manager of the Chicago office and warehouse of Bay State Abrasive Products Co., Westboro, Mass. For the last three years Mr. LeMay has been associated with the Norton Co., in the abrasive sales field in Chicago.

E. W. HUSEMANN has joined the metallurgical staff of the La Salle Steel Co., Chicago, Ill. He was formerly with the Copperweld Steel Co. and the Republic Steel Corporation.

EDWIN T. JACKMAN, who has been district manager of the Firth-Sterling Steel Co. in Chicago for the last eighteen years, has resigned.

ARTHUR J. OLSON, heretofore district sales engineer for the Link-Belt Co. at Chicago, Ill., has been appointed district sales manager at Kansas City, Mo., succeeding MAX GIFFEY, who has resigned after forty years' service with the company. Mr. Olson has been in the employ of the Link-Belt Co. since 1918.

Indiana

J. S. TATMAN has been elected chairman of the board of the Roots-Connersville Blower Corporation, Connersville, Ind., and JOHN AVERY has been elected president and general manager.

VINCENT R. KELLY, 27 E. Westfield Blvd., Indianapolis, Ind., has been appointed sales engineer for the Indiana territory by the Udylite Corporation, Detroit, Mich.

Michigan

DOSTAL PER-MOLD FOUNDRY CO., Detroit, Mich., has been organized by Joseph L. Dostal, formerly vice-president and general manager of the Foundry Division of the Eaton Mfg. Co. The new concern has purchased the Die Typing Corporation's plant at Pontiac, and expects to employ 200 men in producing permanent gray iron castings for the automotive, refrigerator, and home appliance industries. Mr. Dostal was general manager for many years of the Holley Permanent Mold Machine Co., Inc. Julian G. McIntosh and J. A. McIntosh are partners of Mr. Dostal in the new enterprise.

ALVAN MACAULEY, chairman of the board of the Packard Motor Car Co., has resigned as president of the Automobile Manufacturers Association, Detroit, Mich., after serving in that position for eighteen years. Mr. Macauley, who has displayed a high degree of industrial statesmanship throughout his career, aided in formulating many of the automotive industry's major policies. He played an important part in preparing the industry for the huge tasks it assumed in connection with war production. He is succeeded by GEORGE W. MASON, president of the Nash-Kelvinator Corporation.

LIEUTENANT LELAND WALLACE, JR., recently released from the U. S. Army, has joined the magnesium sales staff of the Dow Chemical Co., Midland, Mich., and will work in the St. Louis, Mo., office. LIEUTENANT COLONEL GUY DEKUIPER, also recently discharged from the army, has returned to work with the magnesium sales staff, and will be stationed at the Washington office. He was formerly with the New York sales office of the company.

A. C. HABERKORN MACHINERY CO., 412 New Center Bldg., Detroit, Mich., has been appointed distributor in the Detroit area for the Denison Engineering Co., 1160 Dublin Road, Columbus, Ohio, manufacturer of the "Multipress" and other types of hydraulic presses and hydraulic accessories.

JAMES F. HOFFER has been appointed chief engineer of the Superdraulic Corporation, Dearborn, Mich. Until recently he was chief research engineer of Hydraulic Machinery, Inc., and will continue to serve as engineering consultant with that organization.

WICKMAN CORPORATION, 15533 Woodrow Wilson Ave., Detroit 3, Mich., announces that it has acquired the sales and servicing rights in the United States for Tornos high-precision Swiss automatics.

JOHN S. SHAFER has joined Hydraulic Machinery, Inc., Dearborn, Mich., as sales engineer. For the last five years, he has been in charge of engineering at the Robbins Engineering Co.

New England

SIGMUND A. CZARNECKI has been appointed production engineer for the Hamilton Standard Propellers Division, United Aircraft Corporation, East Hartford, Conn. Mr. Czarnecki has been associated with Hamilton Standard and its predecessor companies for the last nineteen years. In his new capacity he will have charge of all activities of the tool and equipment engineering department of the propellers division.

MASON BRITTON has been elected president of the Metal Cutting Tool Institute, 410 Asylum St., Hartford, Conn. Mr. Britton was formerly vice-president of the McGraw-Hill Publishing Co., treasurer of the War Advertising Council, director of Tools Division, Office of

INDEPENDENT INVESTIGATOR FINDS

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This investigator from James O. Peck Co., industrial research authorities, is visiting representative plants to get unbiased facts on assembly savings. Get his fact-filled reports!

"THEY'RE MUCH, MUCH FASTER by every driving test," Harry L. Spencer, Bendix V. P. in charge of manufacturing, told the investigator. "Since we'll use well over 19,000,000 Phillips Screws this year on washer production alone, that means an important saving.

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"UNSIGHTLY SLOTS with burrs to snag clothes just couldn't be tolerated on a washer. We get no burrs with the Phillips Head – and it looks well, wherever it shows."

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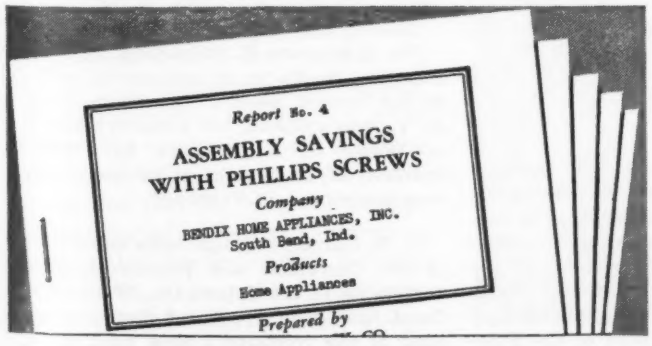

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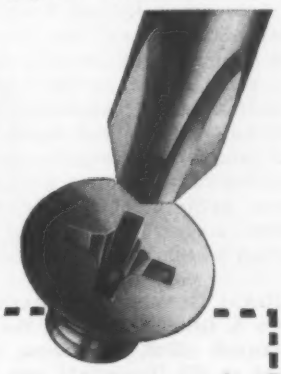

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The Southington Hardware Mfg. Co.
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Mason Britton, Newly Elected President of the Metal Cutting Tool Institute

Production Management, and administrator of the Surplus War Property Administration and Surplus Property Board.

WILMOT F. WHEELER has been elected president of the American Chain & Cable Co., Bridgeport, Conn., succeeding the late William T. Morris. Mr. Wheeler has been with the company since 1916. He has been executive vice-president and treasurer since 1936. CYRUS N. JOHNS succeeds him as executive vice-president.

J. F. THOLL, for the last fifteen years general manager of the American Tool & Machine Co., Hyde Park (Boston 36), Mass., has been elected president, succeeding C. I. DAY, who becomes chairman of the board.

New Jersey

MANHATTAN RUBBER DIVISION OF RAYBESTOS-MANHATTAN, INC., Passaic, N. J., has resumed production of the vibration dampener known as the V.D.B. resilient grinding wheel mounting, which was originally introduced seven years ago, but which the company was forced to withdraw from the market shortly afterward because of rubber restrictions. These mountings are used with Manhattan wheels for portable grinders.

METAL CARBIDES CORPORATION, Youngstown 5, Ohio, announces the opening of a branch office, warehouse, and service plant at 166 Bloomfield Ave., Newark 4, N. J., where a stock of standard tungsten-carbide tools, dies, and wear-resistant parts is maintained, together with equipment for regrinding or repairing these tools.

HUNGERFORD PLASTICS CORPORATION, Murray Hill, N. J., has been organized to provide a complete thermo-plastic service, including product and mold design, mold manufacture, material compounding, and injection and extrusion molding. DAN C. HUNGERFORD is president and JACK SANDLER vice-president of the new organization.

E. MOSTHAF announces his resignation as chief engineer of the H. L. Crowley Corporation, West Orange, N. J., to enter private consulting work, specializing in the design of powdered metal parts and pressing dies. His headquarters are at 363 Lincoln Ave., Orange, N. J.

GROVER C. SCHANTZ has been appointed production superintendent of the Optimus Equipment Co., Matawan, N. J., manufacturer of metal washing and drying equipment. He was previously plant superintendent of the Metalwash Machinery Co., Irvington, N. J.

JAMES ADAIR has joined the sales engineering staff of the Star Electric Motor Co., Bloomfield, N. J., and will represent the company in the New Jersey area. He was formerly connected with the Newark office of the Westinghouse Electric Corporation.

HARRY E. SMITH has been placed in complete charge of the rubber product sales and marketing of Raybestos-Manhattan, Inc., Passaic, N. J. Mr. Smith is vice-president of the Manhattan Rubber Division of the corporation.

W. K. SIMS has recently been appointed exclusive sales representative for C. B. HUNT & SON, INC., Salem, Ohio, replacing M. A. RUMELY. Mr. Sims will be located at 24 Commerce St., Newark, N. J.

REGAL TOOL & MANUFACTURING CO., INC., announces the merging of its Harrison and Newark plants at 39-53 Long Ave., Hillside, N. J.

A. G. YORK and F. H. STILLMAN have been elected members of the board of directors of the Watson-Stillman Co., Roselle, N. J.

New York

POLYTECHNIC RESEARCH AND DEVELOPMENT CO., INC., 66 Court St., Brooklyn, N. Y., announces the opening of a consulting engineering laboratory, coincident with a change in the name of the company, which was originally P.I.B. PRODUCTS, INC. The concern is headed by DR. H. S. ROGERS, president of the Polytechnic Institute of Brooklyn, and under the technical direction of F. J. GAFFNEY, formerly in charge of measurement and test equipment development at the Radiation Laboratory of the Massachusetts Institute of Technology.

LAKE ERIE ENGINEERING CORPORATION, Buffalo, N. J., announces the appointment of EDWARD A. CARNEY as sales representative of the corporation in the Detroit district. Mr. Carney is located at 1115 Book Bldg., Washington Blvd., Detroit. The corporation has also appointed H. VANDER SCHILDEN sales representative in the Chicago district, with headquarters at 230 N. Michigan Ave., Room 2114, Chicago, Ill.

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., has completed arrangements with the AIRCO EXPORT CORPORATION OF NEW YORK, subsidiary of AIR REDUCTION CO., for world-wide sales representation on an exclusive basis for its stainless steel products, electrical steels, and alloys. The U.S.S.R. and Canada are not included in these arrangements.

ELGIN TOOL WORKS, INC., Chicago, Ill., has appointed the GEORGE SCHERR CO., INC., 200 Lafayette St., New York 12, N. Y., exclusive metropolitan representative in the New York territory for the Elgin line of precision bench lathes, screw machines, and vertical and horizontal bench milling machines.

WEDDELL TOOLS, INC., Rochester, N. Y., has acquired a three-story brick building at 37 Centennial St., Rochester, N. Y., for the purpose of consolidating the organization's sales and manufacturing departments and to facilitate meeting the increased demand for Tri-Bit cutters and flywheel arbors and adapters.

COSA CORPORATION, Chrysler Building. New York 17, N. Y., announces the opening of showrooms at 4572 Broadway, New York City. Many of the Swiss high-precision machine tools and measuring instruments for which this company is agent will be on permanent exhibit at these showrooms.

ROBERT G. LEARY, Ansonia Hotel, 74th St. and Broadway, New York City, has been appointed a sales representative of the Eastern Stainless Steel Corporation, Baltimore 3, Md. His territory will include northern New Jersey, New York City, and several counties in New York State.

DR. ALEXANDER R. STEVENSON, JR., vice-president in charge of engineering policy of the General Electric Co., Schenectady, N. Y., was awarded the honorary degree of Doctor of Engineering by Stevens Institute of Technology at its mid-winter commencement in February.

G. H. GAITES, regional sales supervisor of the Cleveland and Pittsburgh sales territories of the Bristol Co., Waterbury, Conn., has been appointed district manager of the company's New York office, located in the Fisk Bldg, 250 W. 57th St.

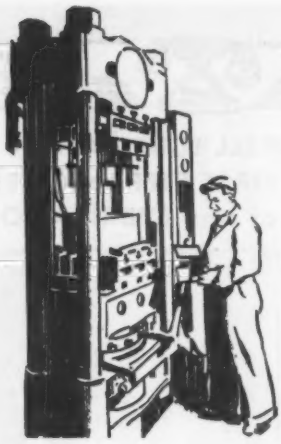
WELDING ENGINEERING SALES CORPORATION, 110 E. 42nd St., New York City, has been made exclusive representative of the line of resistance welding machines built by the PRECISION WELDER & MACHINE CO., Cincinnati, Ohio.

WALTER F. SPOERL has been made general sales manager of the Mechanical Goods Division of the United States Rubber Co., Rockefeller Center, New York City, succeeding Herman A. Ever-

MACHINING DATA ON PLASTICS

8. ENGRAVING

(PART ONE OF THREE PARTS)



This is the eighth in a series of messages designed to better your knowledge of the phenolics—the most versatile of all plastics . . . the type of plastics which Durez has specialized in producing during the past quarter century.

The most practical method of engraving numerals, monograms, lettering and such is by direct molding operation. For example, if recessed lettering is desired in the molded product, the lettering is raised in the mold cavity and if, on the other hand, raised lettering is desired, the lettering is stamped into the mold cavity.

Engraving The Mold Cavity

For best results in producing raised lettering on the mold cavity (this, of course, produces recessed lettering in the molded plastic part), most experienced molders use the hobbing process. This is very economical from the standpoint of mold construction and proves highly satisfactory for producing an even, smooth background.

For the most satisfactory results in producing recessed lettering in the mold cavity (this results in raised lettering on the molded plastic part), it is recommended that the lettering be machine engraved in the cavity. However, there is also another method whereby the lettering is stamped into the cavity with a master stamp by means of hydraulic pressure or a power press. In doing this, the lettering should be stamped approximately .003" deeper than would seem normal, machining (by turning) or grinding off the excess of the mold to provide a smooth background on the molded part.

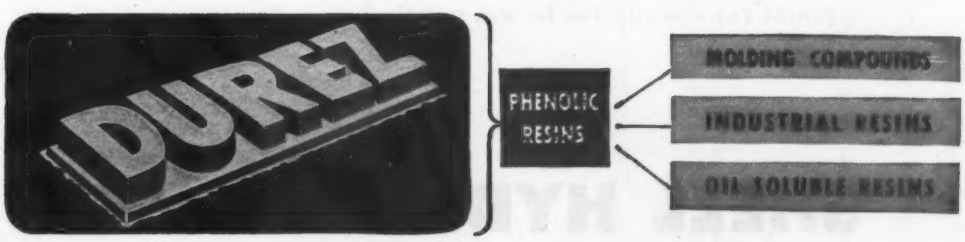
Limitations

Although the molding method will produce millions of lettered parts during the life of the mold, one should remember that it is impossible to deviate from the original engraving other than filling the lettering with different colors. In cases where deviation is desired, other methods such as branding, stamping, or machine-engraving would probably prove more practical. These will be discussed in future ads.

Free Booklet

Write for free, authoritative booklet "Machining Data on Phenolic Plastics." You will find it most helpful because it covers all the standard phenolic plastic machining operations encountered in the average plant. No obligation, of course. Durez Plastics & Chemicals, Inc., 44 Walck Road, N. Tonawanda, N. Y.

This bottle closure is a typical example of engraving by direct molding operation.



PLASTICS THAT FIT THE JOB

PROBLEM: Manufacturer of hydraulic pressure system pumps for 3000-psi service sought a hydraulic oil that (1) would resist oxidation at the 135° F. pump-operating temperature; (2) could be safely used for run-in test purposes; and (3) would have inherent rust-preventive qualities so it could be used as a "shipping" oil.

SOLUTION: When the Shell Lubrication Engineer studied the problem, he recommended a Shell Tellus Oil. The specifications of this oil satisfied the pump maker on points (1) and (2), but he was skeptical of the rust-preventive qualities. A "storage" test was made, and, when Tellus-filled pumps were inspected, no sign of rusting was found. Convinced, the pump maker now uses Shell Tellus Oil exclusively.

CONCLUSION: It pays to consult the Shell Lubrication Engineer, regardless of the nature or size of your lubricating problem. Write for informative literature on Shell Hydraulic Oils. Shell Oil Company, Incorporated, 50 West 50th Street, New York 20, New York; or 100 Bush Street, San Francisco 6, California.

SHELL HYDRAULIC OILS

SHELL

DIFFICULTIES ENCOUNTERED IN HYDRAULIC BENDING MACHINES

Difficulty	Correction
1. Power system will not operate	Check fuses on motor electrical circuit; or check overload relays in motor starter; or check wiring to starter and motor; or check for breakdown in starter or motor.
2. Power system operates, but some or all tools will not function or will only partly function	Pump rotating in wrong direction; or too little oil in hydraulic system; or pressure relief valve set for too low pressure; or bend required is on material beyond the rated capacity of the machine; or, on machine with mechanical stop-valve for regulating angle of bend, lever-handle of valve has slipped out of adjustment (must be adjusted for full stroke back and forward); or some automatic valve is not functioning properly (see hydraulic circuit diagram for the machine—decide which tool is not working and check its automatic valve for correct adjustment and operation); or shut-off valve in hydraulic system is closed; or bearings or bearing pins are jammed or frozen; or an obstruction has been accidentally placed in the way in the machine; or operating chain or link is broken; or pump is broken; or flexible coupling between pump and motor is slipping or broken.
3. Equipment will run in one direction only	Lever-handle of manual control valve has slipped and must be adjusted for full stroke back and forth; or some valve is blocked and traps oil in one end of a cylinder.
4. Machine bends too slowly	Oil is too thin, not to machine specification; or oil has become thin from overheating (this is usually due to too little oil in system).
5. Pumps become noisy	Air trapped in hydraulic system (this is usually due to too little oil).

MACHINERY'S Data Sheet No. 560, April, 1946
Compiled by Wallace Supplies Mfg. Co. Chicago, Ill.

FAULTS IN PIPE AND TUBE BENDS AND THEIR CORRECTION

Fault	Correction
1. Hollow material becomes distorted	Material too soft; or mandrel should be set farther ahead into bend.
2. Wrinkles in throat of bend	Clamping die not tight enough; or mandrel should be set farther ahead into bend; or shoe not set properly; or pressure die should apply more pressure.
3. Material slips	Clamping die not tight enough; or clamping die or clamped portion of material may be greasy; or pressure die is too tight.
4. Wrinkles in part of throat of bend	Form not properly centered on machine.
5. Material locks and is stopped during bending	Same as 4.
6. Material breaks	Material too hard; or too much pressure on pressure die; or mandrel set too far ahead in bend; or jerky start of bend (power not even enough, or possibly air in hydraulic circuit); or bend radius too small.
7. Material is scratched, grooved, or ridged	Roughness on form, pressure die, shoe, or mandrel; or clamping die or pressure die not holding material at same level as form does.
8. Material springs too much (more than expected and desired)	Material too hard; or mandrel should be set farther ahead in bend; or more pressure needed on pressure die; or form is too big.
9. Material springs too little (less than expected and desired)	Material too soft; or mandrel too far ahead; or less pressure needed on pressure die; or form is too small.

MACHINERY'S Data Sheet No. 559, April, 1946
Compiled by Wallace Supplies Mfg. Co. Chicago, Ill.

lien, who recently died after forty-three years' connection with the company.

LARS E. EKHOLM has joined the metallurgical engineering staff of the Climax Molybdenum Co., and will be located in the company's New York office at 500 Fifth Ave. He is a graduate of Lehigh University.

KENNETH K. BOYNTON has been elected vice-president of the International General Electric Co., Inc. He will establish temporary quarters at Crown House, Aldwych, London W. C. 2, England.

Ohio

R. H. DAVIES has been appointed consulting engineer in charge of the educational work of the Lincoln Electric Co., Cleveland, Ohio. Mr. Davies has had wide experience in the industrial engineering field. For the last two and one-half years he has been the Lincoln representative in Washington, D. C., where he did consulting engineering work in connection with the Army, Navy, and other Government agencies. He will act as consultant on the use and design of welded steel in machine manufacturing and structural construction, with headquarters in Cleveland.

R. H. Davies, Newly Appointed Consulting Engineer for the Lincoln Electric Co.

BRADFORD MACHINE TOOL CO., Cincinnati, Ohio, is now manufacturing, in addition to its line of Metal Master lathes, a complete line of Metal Master electrical tools. The company has greatly expanded its production facilities to take care of this new line, and has appointed GEORGE D. BEHLEN head of the electrical tool division. Mr. Behlen was formerly chief engineer and production manager of the U. S. Electrical Tool Co., and has had thirty years of experience in the design and production of this class of equipment.

PAUL J. BASTIAN has been appointed vice-president in charge of manufacturing of the Tyson Bearing Corporation, Massillon, Ohio. Mr. Bastian was previously production manager of the Watson-Flagg Machine Co., of Paterson, N. J. P. W. BROWN, recently retired director of manufacturing for the Wright Aeronautical Corporation, has been appointed director of production for the corporation. He has also been named a member of the board of directors.

RELIANCE ELECTRIC & ENGINEERING CO., 1088 Ivanhoe Road, Cleveland, Ohio, is planning the building of a new plant in Ashtabula, Ohio. The plant will be one story in height and will cover 120,000 square feet of manufacturing area, employing approximately five hundred people on two shifts. The building, with machinery and equipment, will represent an investment close to $1,500,000.

DELAMAR MCWORKMAN, for many years a director and plant manager of Noblitt-Sparks Industries, Inc., Columbus, Ind., and who retired from active duty last August, has formed a consulting engineering firm known as the WILLARD ENGINEERING CO. at 102 N. First St., Miamisburg, Ohio. The new company will specialize in manufacturing methods, offering a production service to industry.

R. W. GEMMELL has been appointed manager of the aircraft sales department of the Small Motor Division of the Westinghouse Electric Corporation, located in Lima, Ohio. He was previously special representative of the division in the Pacific Coast district, and succeeds N. C. REED, who has been transferred to the Elevator Division of the company in Jersey City.

E. H. WELKER, president of the Welker Machinery Co., Inc., New Center Bldg., Detroit, Mich., has been elected a member of the board of directors of the General Machinery Corporation, Hamilton, Ohio, and will promote the sale of the corporation's products, including Hamilton presses, Niles industrial and railroad tools, and United Welding Co.'s steel fabrications.

GEORGE P. TORRENCE, president, and JOHN S. CLARK, vice-president and treasurer of the Cleveland Pneumatic Tool Co., Cleveland, Ohio, have resigned their positions. It is announced that the executive posts and directorships held by these two men will not be filled at present. Mr. Torrence has been president of the concern since March, 1944.

CHARLES R. NEWPHER, until recently sales engineer in the Cleveland district office of the Reliance Electric & Engineering Co., has been appointed production manager of the Ivanhoe Division of the company. FRANK A. YUSEK, assistant superintendent, has been made factory superintendent of the same division.

HOWARD H. WILDER has been made chief metallurgist of the Foundry Division of the Eaton Mfg. Co., Cleveland, Ohio. He was previously research metallurgist of the Wilson Foundry Machine Co., Pontiac, Mich.

DAVID CRAWFORD has been appointed Mid-West district sales manager of the American Welding & Mfg. Co., Warren, Ohio. This district includes southern Ohio, Kentucky, Indiana, and part of Illinois.

Pennsylvania

L. E. OSBORNE was recently named senior operating vice-president of the Westinghouse Electric Corporation, Pittsburgh, Pa. Mr. Osborne joined the Westinghouse organization at the age of sixteen as a clerk in the tool-room at the East Pittsburgh Works. Throughout the recent war he was the directing head of the company's Steam Division at South Philadelphia, Pa., and from early 1943 on, was also responsible for the adjoining Merchant Marine Division, which Westinghouse operated for the United States Maritime Commission.

L. E. Osborne, Recently Named Westinghouse Senior Operating Vice-president

JESSOP STEEL CO., Washington, Pa., announces the formation of the JESSOP EXPORT SALES CORPORATION, with offices in the Evening Post Building, 75 West St., New York 6, N. Y. R. M. PAXTON, JR., district manager of the Jessop Steel Co., is vice-president and manager of the new corporation, and H. M. DAWSON is director of sales. The Jessop Steel Co. also announces the formation of a new Special Alloy Division to advise users of alloy steels in their reconversion programs.

R. W. MOFFETT has resigned as president of the By-Products Steel Corporation, subsidiary of the Lukens Steel Co., Coatesville, Pa., to become general manager, fabrication, of the Lukens Steel

Co. C. L. Huston, Jr., has resigned as president fo Lukenweld, Inc., to become executive assistant to the president of the Lukens Steel Co. Robert W. Wolcott, president of the Lukens Steel Co., has been elected president and chairman of the board of both the By-Products Steel Corporation and Lukenweld, Inc.

Jones & Laughlin Steel Corporation, Pittsburgh, Pa., has established a new district sales office in Indianapolis, with H. M. Knobloch in charge. Other appointments announced by the company are as follows: R. G. Scoggins has been made district sales manager in Los Angeles, Calif., W. S. Wainright district sales manager in San Francisco, and W. L. O'Connell resident manager of sales in South Bend, Ind.

E. F. Houghton & Co., Philadelphia, Pa., has announced the opening of a five-story addition to its plant. The new building was recently acquired from North Bros. Mfg. Co., and is located at N. American and Summerset Sts., opposite the main plant of the company. It will be used for the manufacture of synthetic detergents and finishing materials for textile and other industries, as well as for additional warehouse space.

Kennametal, Inc., Latrobe, Pa., has established an office at 538 N. Erie St., Toledo, Ohio, with E. D. Porter in charge, for the distribution and servicing of Kennametal single-point tools and milling cutters. Another district office has been established in the American Bank Bldg., 600 Grant St., Pittsburgh, Pa., serving western Pennsylvania and West Virginia, with Fred J. Hennig, Jr., in charge as manager.

David W. R. Morgan, manager of the Steam Division of the Westinghouse Corporation, has been appointed general manager of the entire South Philadelphia Works. His responsibilities will also include the general supervision of the Aviation Gas Turbine Division, and the Attica, N. Y., plant of the stoker department. He will retain direct management of the Steam Division.

National Electric Products Corporation announces that on May 1 the general offices of the corporation will be moved from 411 Seventh Ave., Pittsburgh 19, Pa., to the Chamber of Commerce Building, where it will occupy the thirteenth floor. The concern has been located in its previous location for the last forty years.

A. P. de Sanno & Son, Inc., announces the removal of the Philadelphia office of the concern, where all the business pertaining to Radiac abrasive cutting-off machines is handled, from 106 S. 16th St. to Room 509. Otis Bldg., 112 S. 16th St., Philadelphia 2, Pa. A demonstrating room and laboratory will be maintained at the old address.

Carl E. Nagel has been appointed manager of editorial service of Westinghouse Electric Corporation, Pittsburgh 30, Pa. Mr. Nagel, a recently discharged veteran of World War II, will be responsible for the company's technical and trade magazine articles. He is a graduate in engineering and economics of Stanford University.

Carl E. Nagel, New Manager of Editorial Service, Westinghouse Electric Corporation

F. C. Messaros has been appointed chief engineer of the American Engineering Co., Philadelphia, Pa., manufacturer of "Lo-Hed" hoists, marine equipment, Hele-Shaw fluid-power pumps, etc. J. S. Frame has been made chief draftsman. Both men have been with the company over twenty years.

John D. Hall, who has been connected with the Braeburn Alloy Steel Corporation, Braeburn, Pa., for fifteen years, and who has been associated with the tool steel business for almost thirty five years, has resigned and has gone to Florida for his health.

John K. Hodnette has been made manager of the Transformer Division of the Westinghouse Electric Corporation at Sharon, Pa. For the last six years he has been engineering manager in that division. In his new post he succeeds the late H. V. Putnam.

Newcomer Products, Latrobe, Pa., announces that the strain-free brazing tools of cemented carbide produced by this organization will hereafter be distributed on a national scale by the Greenleaf Corporation, Wilkinsburg, Pittsburgh 21, Pa.

Hardinge Co., Inc., York, Pa., has obtained the manufacturing and sales rights for the BLM "Auto-Centri" clutch made by the Automatic Clutch Corporation of Canada, a subsidiary of the British Meter Co.

William B. Bauzenberger has been appointed manager of sales of the Apex Alkali Products Co., Philadelphia, Pa., manufacturer of wire and tube drawing lubricant, coatings, and cleaners for ferrous and non-ferrous products.

A. J. Kerr, formerly general sales manager of the Rockwell Mfg. Co., Pittsburgh, Pa., has been elected vice-president of sales. He has been with the company for more than twenty years.

Voss Machinery Co., 2882 W. Liberty Ave., Pittsburgh, Pa., has been appointed distributor for the Republic Drill & Tool Co., Chicago, Ill., in western Pennsylvania, West Virginia, eastern Ohio, and western Maryland.

S. B. Knutson has been appointed general superintendent of the Flexsteel Division of the National Electric Products Corporation at Ambridge, Pa.

Robert A. Parks has been named general sales manager of the Jessop Steel Co., Washington, Pa. He was formerly district manager in Washington, D. C.

E. R. McClung, Jr., has joined the staff of Lukenweld, Inc., division of Lukens Steel Co., Coatesville, Pa., as welding engineer.

Wisconsin and Minnesota

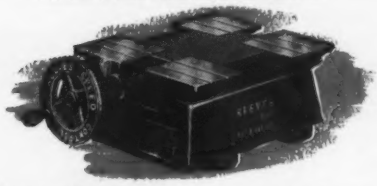
R. F. Muller, sales engineer connected with the New Orleans district office of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., has been promoted to the position of assistant manager of that office.

Ira R. Ogilvie has been appointed sales promotion and advertising manager of the George Gorton Machine Co., Racine, Wis., manufacturer of tracer-controlled milling machines, pantograph engraving machines, electric arc etchers, and automatic screw machines. Mr. Ogilvie was recently released from the Army.

Ira R. Ogilvie, Sales Promotion and Advertising Manager, George Gorton Machine Co.

How to convert any standard constant speed motor to a Low Cost *Stepless Variable Speed Drive*

1 Mount Your Motor on This REEVES Motor Base

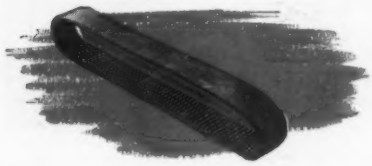


Base is built in wide range of sizes to fit any standard constant speed motor up to 15 h.p. Includes sliding platform and handwheel for moving motor forward or back.

2 Apply This Disc Assembly to Motor Shaft

Assembly consists of two facing cone-shaped discs, one stationary, the other sliding laterally, and compression spring for mounting on extension shaft of motor.

3 Connect to Driven Machine With This Special V-Belt



Place specially designed REEVES V-belt between discs and over pulley on power input shaft of the driven machine. Adjust belt to minimum center. Anchor motor base.

. . . and you have a

REEVES Vari-Speed Motor Pulley

available in sizes to 15 h.p. for stepless speed adjustability within 4:1 range.

HOW IT WORKS: The operation of a REEVES Motor Pulley is extremely simple—yet it follows the time-tested REEVES principle of a V-belt traveling between the adjustable driving diameters of cone-shaped discs. By turning handwheel, motor is moved forward or back on base, varying the driving diameters of the discs. As motor is moved toward driven machine, belt rides higher between discs, thus increasing the speed transmitted. Turning handwheel in opposite direction reverses the operation. Any speed within range is accurately maintained.

WHAT YOU CAN DO WITH IT: The REEVES Motor Pulley is the simplest dependable method of providing infinitely variable speed adjustability to a driven machine. With this low-cost, easy-to-install equipment you can transform a machine with fixed speeds into a far more versatile production unit—one that is instantly responsive to every changing condition and work schedule. Install REEVES Motor Pulleys on your machines in service, and when you buy a new machine, look for the familiar REEVES handwheel that signifies REEVES-equipped.

SEND FOR THIS CATALOG

New, 96-page book gives complete information on this and the two other basic REEVES Speed Control units—the Variable Speed Transmission and the Motodrive. Ask for Catalog M-450.

REEVES PULLEY COMPANY, COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

Accurate Variable

REEVES Speed Control

Gives the Right Speed for Every Job

J. P. HENRY has been made eastern zone manager for Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4, Wis., in charge of district engineering offices in Hartford, Conn., Newark, N. J., Philadelphia, Pa., and Washington, D. C. Zone headquarters have been transferred to Room 624, Capitol National Bank Bldg., Hartford 3, Conn. The Newark district office will be directed by A. M. SMITH and J. W. NEBEL. W. F. TAFF has been transferred from the Cincinnati district office to Indianapolis, where he will continue to serve as field engineer.

L. R. ROTHENBERGER has been appointed general sales manager of the DoAll Co., Minneapolis, Minn. A graduate of the University of Minnesota, he has been associated with the DoAll organization for the last seven years.

L. R. Rothenberger Recently Appointed General Sales Manager of the DoAll Co.

* * *

Cosa Corporation Exclusive Agent for Swiss Machines

A news item published in February MACHINERY relative to the High Precision Products Co., Westfield, N. J., which was recently established by Gilbert L. Dannehower, stated that the new company handled the sales of Sip jig borers, Maag gear grinders, Bechler automatics, Mikron machines, Studer profile grinders, and Safag gear-hobbing machines on an exclusive basis in New Jersey, eastern Pennsylvania, Delaware, and the District of Columbia. It should have been mentioned that Mr. Dannehower and his new company are representatives of the Cosa Corporation, Chrysler Bldg., New York 17, N. Y., which concern holds the exclusive selling rights for these machines in the United States.

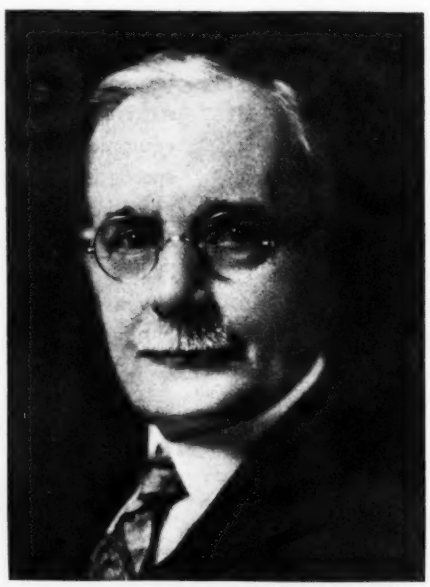
Obituaries

Charles E. Van Norman

Charles Edward Van Norman, chairman of the board of the Van Norman Co., Springfield, Mass., died in Springfield on February 28 at the age of eighty-six years. Mr. Van Norman was born in Hamilton, Ontario, Canada, of Dutch-English parentage, and came to the United States at an early age. In 1882, he and his brother, Frederick D. Van Norman, who survives him, entered the business that had been founded in 1877 by their father, C. H. Van Norman, in Waltham, Mass. This enterprise was first known as the Hopkins Watch Tool Co. and was engaged entirely in the manufacturer of watchmakers' lathes and tools. In 1880, the name was changed to the Waltham Watch Tool Co., and two years later, the firm moved to Springfield, Mass., where a line of milling machines was added. As time went on, the watch tool manufacture was discontinued and the company devoted itself to the making of larger milling machines, many of which are still characterized by the movable cutter-head and sliding ram that Charles Van Norman originally designed in collaboration with his brother.

In 1912, the company was reorganized and incorporated as the Van Norman Machine Tool Co. Charles Van Norman became president of the company, a position that he occupied until he became chairman of the board in 1940, when James Y. Scott succeeded him as president. In 1943, the name of the company was changed to the Van Norman Co.

During the sixty-four years that Mr. Van Norman was connected with this enterprise, he saw it grow from a small shop to one of the large and highly diversified plants of the machine tool industry, producing milling machines, oscillating radius grinders, and automotive service machines. The growth of the organization that he founded is due in great part to his outstanding ability as a designer, to his integrity as an employer and business man, and to the friendly sincerity of his character.



© Blackstone Studios

Charles E. Van Norman

Joseph W. McLean

Joseph W. McLean, until his retirement on November 1, 1945, president of the Simonds Abrasive Co., Philadelphia, Pa., died in Philadelphia on March 7 after a long illness. Mr. McLean was associated for forty-four years with the Simonds Saw & Steel Co., starting in 1901 as a clerk in the Chicago branch. He was transferred to the San Francisco office in 1903, where his presence of mind saved the company records at the time of the earthquake and fire in 1906. Returning to Chicago as district sales manager in 1917, he continued in that capacity until 1930, when he was elected secretary and a director of the Abrasive Co.—now the Simonds Abrasive Co.—a division of the Simonds Saw & Steel Co. In the same year, he was made general manager, and in 1941 became president of the company.

Mr. McLean was a director of the Market Street National Bank in Philadelphia, and was active in many Philadelphia business and civic-affair organizations.

© Bachrach

Joseph W. McLean

ALVIN K. SMALLEY, manager of sales of the Welded Alloy Tube Division of the Carpenter Steel Co., Kenilworth, N. J., died on January 29 at the age of fifty years. Mr. Smalley had been associated with the company for fifteen years. He is succeeded by Philip L. Coddington, acting manager of sales.


TAPS WITH DRILL OR REAMING SECTIONS
LONG TAPS AND SHORT TAPS
TAPS WITH SHORT OR LONG CHAMFER
STEPPED TAPS AND STRAIGHT TAPS
LARGE TAPS AND SMALL TAPS
SPIRAL POINTED OR INTERRUPTED THREAD TAPS
ALL KINDS OF TAPERED TAPS
• GROUND TAPS • THREAD MILLING CUTTERS • THREAD GAGES & SPECIAL THREADING TOOLS, MACHINES AND CHECKERS •
You can recondition all these taps ON A DETROIT
TAP RECONDITIONER
Having one of these DETROIT 4 in 1 tap reconditioners in your shop is just like getting an almost unlimited supply of NEW TAPS for next to nothing. With this simple low cost machine you can quickly put your worn taps back in first class condition. The machine will chamfer the taps, grind from 2 to 6 flutes, spiral point them where required and polish the points. Pays for itself in a remarkably short time. Write today for complete descriptive Bulletin #DTR-2.
DETROIT
TAP & TOOL CO.
8432 BUTLER AVE. • DETROIT 11, MICHIGAN

Classified Contents of This Number